

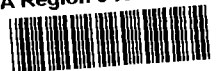
REC'D 12/08/00 E7 12/11/00



**GROUNDWATER MONITORING REPORT -
OCTOBER 2000
INTERMITTENT OPERATION OF THE
GROUNDWATER REMEDIATION SYSTEM**

**SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

EPA Region 5 Records Ctr.



268549



**GROUNDWATER MONITORING REPORT -
OCTOBER 2000
INTERMITTENT OPERATION OF THE
GROUNDWATER REMEDIATION SYSTEM**

**SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

**DECEMBER 2000
REF. NO. 3581 (34)**

This report is printed on recycled paper.

**Prepared by:
Conestoga-Rovers
& Associates**

651 Colby Drive
Waterloo, Ontario
Canada N2V 1C2

Office: 519•884•0510
Fax: 519•884•0525



**CONESTOGA-ROVERS
& ASSOCIATES**

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: 519-884-0510 Facsimile: 519-884-0525
www.CRAworld.com

December 7, 2000

Reference No. 3581

Mr. Ken Glatz
Remedial Project Manager
United States Environmental Protection Agency
Region V (HSRW-6J)
77 West Jackson Street
Chicago, Illinois

Dear Mr. Glatz:

Re: Groundwater Monitoring Report - October 2000, Intermittent Operation of the
Groundwater Remediation System
Spiegelberg Site, Livingston County, Michigan

Please find enclosed three copies of the report titled "*Groundwater Monitoring Report - October 2000*". Conestoga-Rovers & Associates (CRA) has prepared this report on behalf of Ford Motor Company to document the field activities and results of the groundwater monitoring event completed during October 2000 at the Spiegelberg Site (Site). These field activities, data evaluations and reporting were conducted in accordance with the "*Protocol for Intermittent Operation of the Groundwater Remediation System*" (CRA, August 1998), as approved by the United States Environmental Protection Agency (USEPA) in its letter of September 14, 1998 (Glatz to Nadeau).

The October 2000 groundwater monitoring event included hydraulic monitoring and groundwater sampling for analysis of volatile organic compounds (VOCs). As presented in Section 3.0 of this report, evaluation of the data collected during the October 2000 groundwater monitoring event indicates that groundwater flow is consistent with previous investigations and that there are no exceedances of the applicable criteria for VOCs at the Site. Based on this evaluation, no contingency evaluations or modifications to the Long-Term Monitoring Plan (LTMP) as described in the "*Additional Investigation Report*" (CRA, April 1999) are necessary. The next groundwater monitoring event is scheduled to occur in January 2001.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Angela Mason, B.Sc. (ENG)

AM/pw/111
Encl.

c.c.: Judy Gapp, Michigan Department of Environmental Quality (MDEQ), 2 copies
David Miller, Ford Motor Company
Steven C. Nadeau, Honigman Miller Schwartz and Cohn

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION.....	1
1.1 SCOPE OF WORK.....	1
2.0 SUMMARY OF FIELD ACTIVITIES.....	3
2.1 HYDRAULIC MONITORING.....	3
2.2 GROUNDWATER SAMPLE COLLECTION AND ANALYSIS	3
3.0 RESULTS OF OCTOBER 2000 MONITORING EVENT.....	5
3.1 HYDRAULIC MONITORING.....	5
3.1.1 UPPER AQUIFER.....	6
3.1.2 LOWER AQUIFER.....	6
3.2 CHEMICAL MONITORING	6
3.2.1 UPPER AQUIFER.....	7
3.2.2 LOWER AQUIFER.....	8
4.0 SUMMARY	9
5.0 REFERENCES.....	10

LIST OF FIGURES
(Following Text)

FIGURE 1.1	SITE LOCATION MAP
FIGURE 2.1	HYDRAULIC MONITORING WELL NETWORK
FIGURE 2.2	CHEMICAL MONITORING WELL NETWORK
FIGURE 3.1	UPPER AQUIFER GROUNDWATER ELEVATION CONTOURS, SPIEGELBERG SITE - OCTOBER 2000
FIGURE 3.2	UPPER AQUIFER GROUNDWATER ELEVATION CONTOURS, SPIEGELBERG AND RASMUSSEN SITES - OCTOBER 2000
FIGURE 3.3	LOWER AQUIFER GROUNDWATER ELEVATION CONTOURS, SPIEGELBERG SITE - OCTOBER 2000

LIST OF TABLES
(Following Text)

TABLE 2.1	SUMMARY OF GROUNDWATER ELEVATION DATA – OCTOBER 2000
TABLE 2.2	SUMMARY OF GROUNDWATER ELEVATION DATA – JULY 1999 TO OCTOBER 2000
TABLE 2.3	SUMMARY OF UPPER AQUIFER GROUNDWATER ELEVATION DATA – OCTOBER 2000 - SPIEGELBERG AND RASMUSSEN SITES
TABLE 2.4	SUMMARY OF WELL PURGE DATA – OCTOBER 2000
TABLE 2.5	GROUNDWATER SAMPLE IDENTIFICATION KEY
TABLE 3.1	CHEMICAL MONITORING NETWORK WELL CLASSIFICATION
TABLE 3.2	ANALYTICAL RESULTS SUMMARY - UPPER AQUIFER
TABLE 3.3	ANALYTICAL RESULTS SUMMARY - LOWER AQUIFER
TABLE 3.4	SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA (JULY 1999 TO OCTOBER 2000) - UPPER AQUIFER
TABLE 3.5	SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA (JULY 1999 TO OCTOBER 2000) - LOWER AQUIFER

LIST OF APPENDICES

APPENDIX A	CONTINGENCY PLAN
APPENDIX B	LABORATORY REPORT
APPENDIX C	DATA VALIDATION MEMORANDUM

1.0 INTRODUCTION

In March 1998, the United States Environmental Protection Agency (USEPA), following consultation with the Michigan Department of Environmental Quality (MDEQ), approved the implementation of intermittent operation of the groundwater remediation system at the Spiegelberg Site (Site) in accordance with Section II.D of the RD/RA Scope of Work for the Site dated September 23, 1991. Thereafter, Conestoga-Rovers & Associates (CRA) developed and submitted the "Protocol for Intermittent Operation of the Groundwater Remediation System" (Protocol, CRA, August 1998). The Protocol was approved by USEPA on September 14, 1998. This submission is the first groundwater monitoring report for the second year of the Long-Term Monitoring Plan (LTMP) for the Site as required under the terms of the Protocol. A Site location map is presented on Figure 1.1.

1.1 SCOPE OF WORK

The following scope of work (SOW) was established under the terms of the Protocol:

1. commencement of intermittent operation of the groundwater remediation system;
2. confirmatory hydraulic monitoring;
3. additional hydrogeologic investigations, including vertical aquifer sampling (VAS) and baseline sampling;
4. installation of additional monitoring wells for the LTMP;
5. chemical and hydraulic monitoring; and
6. implementation of a contingency plan (if necessary).

Items 1 through 4, inclusive, have already been completed. Intermittent operation of the groundwater remediation system commenced on September 20, 1998. Confirmatory hydraulic monitoring was conducted in November and December 1998, and was reported in CRA's letter report to Mr. Ken Glatz, dated January 5, 1999. The additional hydrogeologic investigations were completed in February 1999 and were reported in CRA's report titled "Additional Investigation Report - Intermittent Operation of Groundwater Remediation System" (CRA, April 1999).

Installation of the additional monitoring wells for the LTMP (Item 4) and the details of the first quarterly hydraulic and chemical monitoring event (Item 5), which was

conducted during June and July 1999, were reported in the "First Quarterly Groundwater Monitoring Report" (CRA, August 1999). The conditions pertaining to Item 6, the contingency plan, are evaluated with each monitoring event. To date, no contingency actions have been required.

2.0 SUMMARY OF FIELD ACTIVITIES

The field activities undertaken during this reporting period included hydraulic monitoring and groundwater sample collection and analysis for Target Compound List (TCL) volatile organic compounds (VOCs). The field activities at the Site were conducted on October 24 and 25, 2000 and consisted of hydraulic monitoring and low flow sampling, as summarized below.

2.1 HYDRAULIC MONITORING

On October 24, 2000, the static groundwater level measurements were completed at the Site. Static groundwater levels were recorded for 26 monitoring wells. Bottom depths were measured using a pre-cleaned water level plover. The measured static groundwater levels are summarized in Table 2.1. Static water levels were collected from the list of hydraulic monitors presented in Table 5.4 of the Protocol and shown on Figure 2.1 of this report, with the exception of SP-MW-25D. The presence of a hornet's nest prevented access to monitoring well SP-MW-25D during the October 2000 event.

For ease of comparison, a summary of static groundwater level measurements collected from July 1999 to October 2000 is presented in Table 2.2.

2.2 GROUNDWATER SAMPLE COLLECTION AND ANALYSIS

The chemical monitoring component of the LTMP consists of quarterly groundwater sampling for TCL VOCs analysis and annual sampling for lead and redox parameters. This quarterly monitoring event consisted of sampling for TCL VOCs analysis only. Lead and redox parameters were sampled for during the baseline and April 2000 monitoring events.

Each of the monitoring wells in the chemical monitoring network (see Figure 2.2) is equipped with a dedicated bladder pump. The dedicated bladder pumps are constructed of stainless steel with a teflon bladder and are equipped with 1/4-inch diameter polyethylene tubing.

In accordance with the Protocol, groundwater samples were collected from the chemical monitoring network wells using the low-flow purging (LFP) and sampling techniques described in Appendix A of the Protocol. The final purge data are provided in Table 2.4. Groundwater samples were collected from SP-MW-60R, CRA-MW-5, SP-MW-51,

SP-MW-51A, OBG-4B, SP-MW-20D, CRA-MW-6, CRA-MW-7, and OBG-4A for analysis of TCL VOCs listed in Appendix C of the Protocol. Due to insufficient water column for the bladder pump to work properly, it was necessary to sample SP-MW-51 with a disposable polyethylene bailer.

The groundwater sample identification key is provided in Table 2.5. The chemical monitoring network wells that were sampled in October 2000 are shown on Figure 2.2. All groundwater samples collected were packed on ice in a cooler and were transported under Chain-of-Custody protocol to Severn Trent Laboratory in North Canton, Ohio.

3.0 RESULTS OF OCTOBER 2000 MONITORING EVENT

The purpose of the LTMP is to track any movement of residual constituents over time and to verify that natural attenuation occurs at a sufficient rate to protect potential downgradient receptors. The LTMP consists of two components: hydraulic monitoring and chemical monitoring as outlined in the Protocol. Hydraulic monitoring and chemical monitoring for VOCs are scheduled to occur on a quarterly basis over the first year of the LTMP, then semi-annually in subsequent years. Following the first year of monitoring and data evaluation, CRA proposed semi-annual monitoring in accordance with the Protocol (CRA, June 2000). In a letter from the EPA dated September 11, 2000 it was requested that quarterly monitoring be continued beyond the first year. Therefore quarterly monitoring was resumed as of October 2000. The October 2000 event represents the fifth hydraulic monitoring and sampling for TCL VOCs analysis under the LTMP.

A contingency plan was developed as a proactive measure to be implemented in the unlikely event that residual concentrations are detected in sentry wells above the trigger concentrations. The contingency plan was presented in the Protocol and is provided in Appendix A of this report. Under the terms of the contingency plan, any exceedance at a sentry well of Michigan Part 201 Residential Cleanup Criteria (Part 201 Criteria) will trigger the evaluation of contingencies as outlined in the contingency plan provided in Appendix A. Under the terms of the contingency plan, any exceedance of the source area well criteria also will trigger the evaluation of contingency actions as outlined in Appendix A. The source area criteria are 6 µg/L for vinyl chloride and 5 µg/L for benzene.

The classification (source/sentry) of the chemical monitoring network is provided in Table 3.1.

3.1 HYDRAULIC MONITORING

The October 2000 hydraulic monitoring event consisted of the measurement of static groundwater levels in 26 Site monitoring wells on October 24, 2000. The monitoring wells that comprise the hydraulic monitoring network are shown on Figure 2.1. Static groundwater levels in all but one of the hydraulic monitors prescribed in the Protocol were measured. During this event the presence of a hornet's nest prevented access to Lower Aquifer monitoring well SP-MW-25D.

The static groundwater level measurements collected at the Spiegelberg Site on October 24, 2000, are presented in Table 2.1. The measured static groundwater levels were used to produce groundwater elevation contours for the Spiegelberg Upper Aquifer and Lower Aquifer as shown on Figures 3.1 and 3.3, respectively.

At the request of the EPA, combined monthly static groundwater level measurements for the Spiegelberg and Rasmussen sites commenced in April 2000. The most recent static groundwater level measurements were collected at the Spiegelberg and Rasmussen Sites on October 31, 2000, these are presented in Table 2.3. The measured static groundwater levels were used to produce combined groundwater elevation contours for the Spiegelberg and Rasmussen Upper Aquifer, as shown on Figure 3.2.

3.1.1 UPPER AQUIFER

The groundwater elevation contours for the Spiegelberg Upper Aquifer are presented on Figure 3.1. Figure 3.1 indicates that groundwater flow in the Upper Aquifer is generally toward the west, which is consistent with the groundwater flow direction based on previous hydraulic monitoring events.

The groundwater elevation contours for the combined Spiegelberg and Rasmussen Upper Aquifer hydraulic monitoring are presented on Figure 3.2. Figure 3.2 indicates that groundwater flow in the Spiegelberg Site Upper Aquifer is generally toward the west, and the groundwater flow in the adjacent Rasmussen site is generally towards the north and northwest.

3.1.2 LOWER AQUIFER

The groundwater elevation contours for the Spiegelberg Lower Aquifer are presented on Figure 3.3. Figure 3.3 indicates that groundwater flow in the Lower Aquifer is in a north-northwest direction. This is consistent with previous groundwater elevation data obtained in November and December 1998, July 1999, October 1999 and in January and April 2000.

3.2 CHEMICAL MONITORING

The October 2000 chemical monitoring event consisted of the sampling of four Upper Aquifer and five Lower Aquifer monitoring wells for VOCs analysis. In accordance

with the Protocol, the analytical results of sentry wells were compared to the Part 201 Criteria and the analytical results of source area wells were compared to the Site-specific contingency triggers for vinyl chloride and benzene. Classification of monitoring wells in the chemical monitoring network is summarized in Table 3.1.

All groundwater samples were analyzed for TCL VOCs by Severn Trent Laboratory in North Canton, Ohio. A copy of the laboratory report is provided in Appendix B.

The analytical data were assessed and validated by CRA's project chemist for conformance with requirements stipulated in the analytical methods and generally accepted laboratory practice. All laboratory data were reviewed for accuracy and conformance with the analytical methods employed. Analytical data were assessed to determine whether qualifications were necessary based on holding time criteria, laboratory method blank samples, surrogate recoveries, laboratory control samples, matrix spike samples, trip blank samples, and field duplicate samples. No field blank samples were required due to the use of dedicated bladder pumps.

The laboratory data were found to exhibit acceptable levels of accuracy and precision as qualified in the data quality assessment and validation memorandum presented in Appendix C.

3.2.1 UPPER AQUIFER

The Upper Aquifer monitoring wells included in the chemical sampling event were SP-MW-60R, SP-MW-51, OBG-4A, and CRA-MW-5. All the Upper Aquifer monitoring wells are classified as source wells. The locations of these monitoring wells are presented on Figure 2.2.

The analytical results of the Upper Aquifer chemical monitoring event are presented in Table 3.2. The Part 201 Criteria for groundwater are also presented in Table 3.2. As indicated in Table 3.2, 1,1,1-TCA, 1,1-DCA, cis-1,2-DCE, 1-1 DCE, chlorobenzene, and vinyl chloride were detected at very low concentrations in the Upper Aquifer. However, the source area criteria of 6 µg/L for vinyl chloride and 5 µg/L for benzene were not exceeded. The concentrations of these VOCs in the Upper Aquifer were all well below the source area criteria and Part 201 criteria. Therefore, no contingency evaluations or actions are necessary.

For ease of comparison, a summary of VOCs detected in the Upper Aquifer from July 1999 to October 2000 is presented in Table 3.4. These data indicate that the VOC

distributions in the Upper Aquifer during the October 2000 event are consistent with those of the previous events. The only difference of note is the detection of very low concentrations of vinyl chloride at CRA-MW-5 during the most recent event. Analytical data from future events will be monitored to confirm this.

3.2.2 LOWER AQUIFER

The Lower Aquifer monitoring wells included in the chemical sampling event were OBG-4B, SP-MW-51A, SP-MW-20D, CRA-MW-6, and CRA-MW-7. Monitoring wells SP-MW-51A and OBG-4B are classified as source area monitoring wells. Monitoring wells CRA-MW-6, SP-MW-20D and CRA-MW-7 are classified as sentry wells. The locations of these monitoring wells are shown on Figure 2.2. All Lower Aquifer chemical monitoring network wells as designated in the Protocol were sampled for TCL VOCs during the October 2000 event.

The analytical results of the Lower Aquifer monitoring event are presented in Table 3.3, along with the applicable Part 201 Criteria.

Examination of the data for the source area monitoring wells (SP-MW-51A and OBG-4B) indicates that very low concentrations of 1,1,1-TCA and 1,1-DCA were detected in the Lower Aquifer. The source area monitoring well analytical data were all well below Part 201 criteria.

With the exception of a low concentration of 1,1-DCA at CRA-MW-7, no TCL VOCs were detected in the sentry monitoring wells. The concentration of 1,1-DCA detected at CRA-MW-7 was well below the Part 201 criteria. Based on these results no contingency evaluations or actions are required.

For ease of comparison, TCL VOCs detected in the Lower Aquifer during the April 2000 and October 2000 monitoring events are summarized in Table 3.5. These data indicate that the VOC distributions in the Lower Aquifer during the October 2000 event are consistent with those obtained from the previous event. The only difference of note is the detection of very low concentrations of 1,1,1-TCA OBG-4B during the most recent event. Analytical data from future events will be monitored to confirm this.

4.0 SUMMARY

The October 2000 groundwater monitoring event of the LTMP for Intermittent Operation of the groundwater remediation system at the Spiegelberg site was conducted on October 24 and 25, 2000. The October 2000 quarterly monitoring event included hydraulic monitoring and groundwater sample collection for analysis of TCL VOCs.

The results of the October 2000 Spiegelberg groundwater monitoring event indicate that groundwater flow in the Upper Aquifer is toward the west. The groundwater elevation contours for the combined Spiegelberg and Rasmussen Upper Aquifer indicates that groundwater flow in the adjacent Rasmussen site is generally towards the north and northwest. The groundwater flow in the Spiegelberg Lower Aquifer is in a north-northwest direction. These groundwater flow directions are consistent with those determined for previous events.

The results of TCL VOCs analysis from groundwater samples collected in October 2000 indicate that there are no exceedances of the vinyl chloride or benzene trigger concentrations at any source area wells in the Upper Aquifer and Lower Aquifer. Benzene was not detected (at a method detection limits of 1 µg/L) in any of the groundwater samples collected during the October 2000 chemical monitoring event. The analytical data indicate that there are no exceedances of Part 201 Criteria at any chemical monitoring network wells. No contingency evaluations or actions are required based on the outcome of TCL VOCs analysis of groundwater samples collected in October 2000.

The next hydraulic and chemical monitoring event for TCL VOCs is scheduled to occur in January 2001. No changes to the Protocol are recommended based on the results of the October 2000 monitoring event.

5.0 REFERENCES

- CRA, August 1998, Protocol for Intermittent Operation of the Groundwater Remediation System, Spiegelberg Site, Livingston County, Michigan, Conestoga-Rovers & Associates, Waterloo, Ontario, Canada.
- CRA, April 1999, Additional Investigation Report - Intermittent Operation of Groundwater Remediation System, Spiegelberg Site, Livingston County, Michigan, Conestoga-Rovers & Associates, Waterloo, Ontario, Canada.
- CRA, August 1999, First Quarterly Groundwater Monitoring Report - July 1999, Intermittent Operation of the Groundwater Remediation System, Conestoga-Rovers & Associates, Waterloo, Ontario, Canada.
- CRA, November 1999, Second Quarterly Groundwater Monitoring Report - October 1999, Intermittent Operation of the Groundwater Remediation System, Conestoga-Rovers & Associates, Waterloo, Ontario, Canada.
- CRA, March 2000, Third Quarterly Groundwater Monitoring Report - January 2000, Intermittent Operation of the Groundwater Remediation System, Conestoga-Rovers & Associates, Waterloo, Ontario, Canada.
- CRA, June 2000, April 2000, Groundwater Monitoring and O&M Annual Summary Report,, Conestoga-Rovers & Associates, Waterloo, Ontario, Canada.

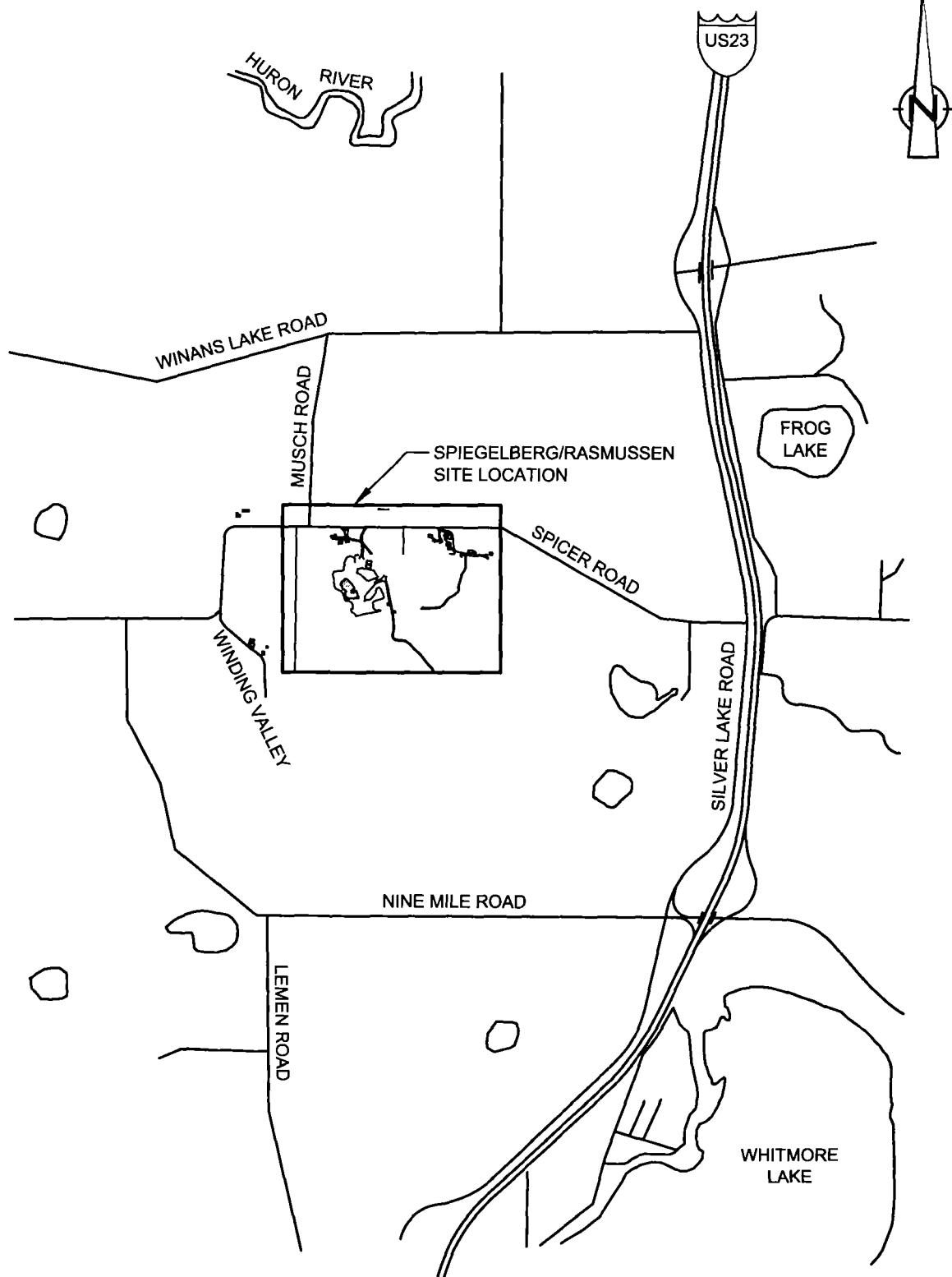


figure 1.1
SITE LOCATION MAP
SPIELGELBERG SITE
Livingston County, Michigan



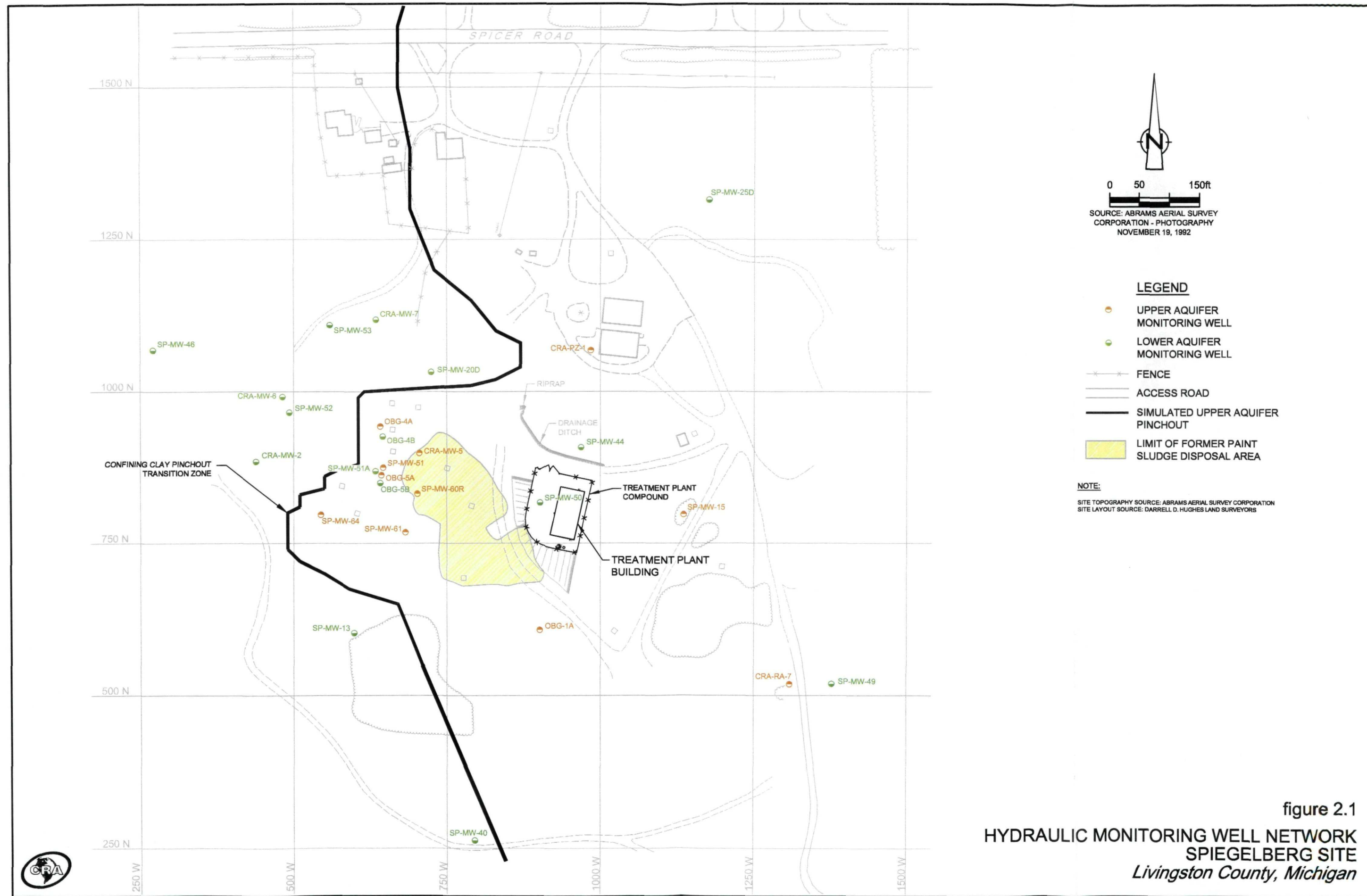


figure 2.1
 HYDRAULIC MONITORING WELL NETWORK
 SPIEGELBERG SITE
 Livingston County, Michigan



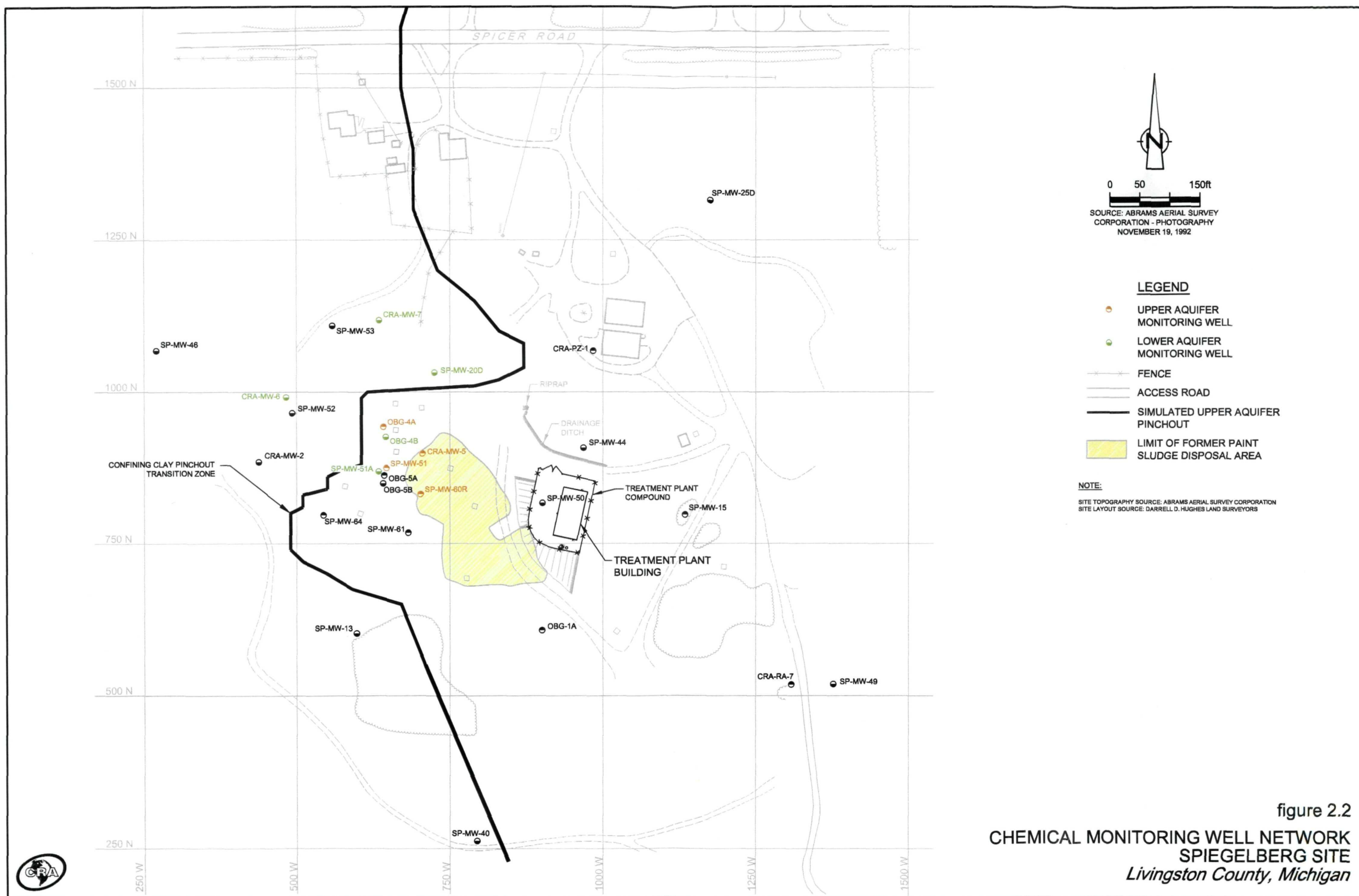


figure 2.2
CHEMICAL MONITORING WELL NETWORK
SPIEGELBERG SITE
Livingston County, Michigan

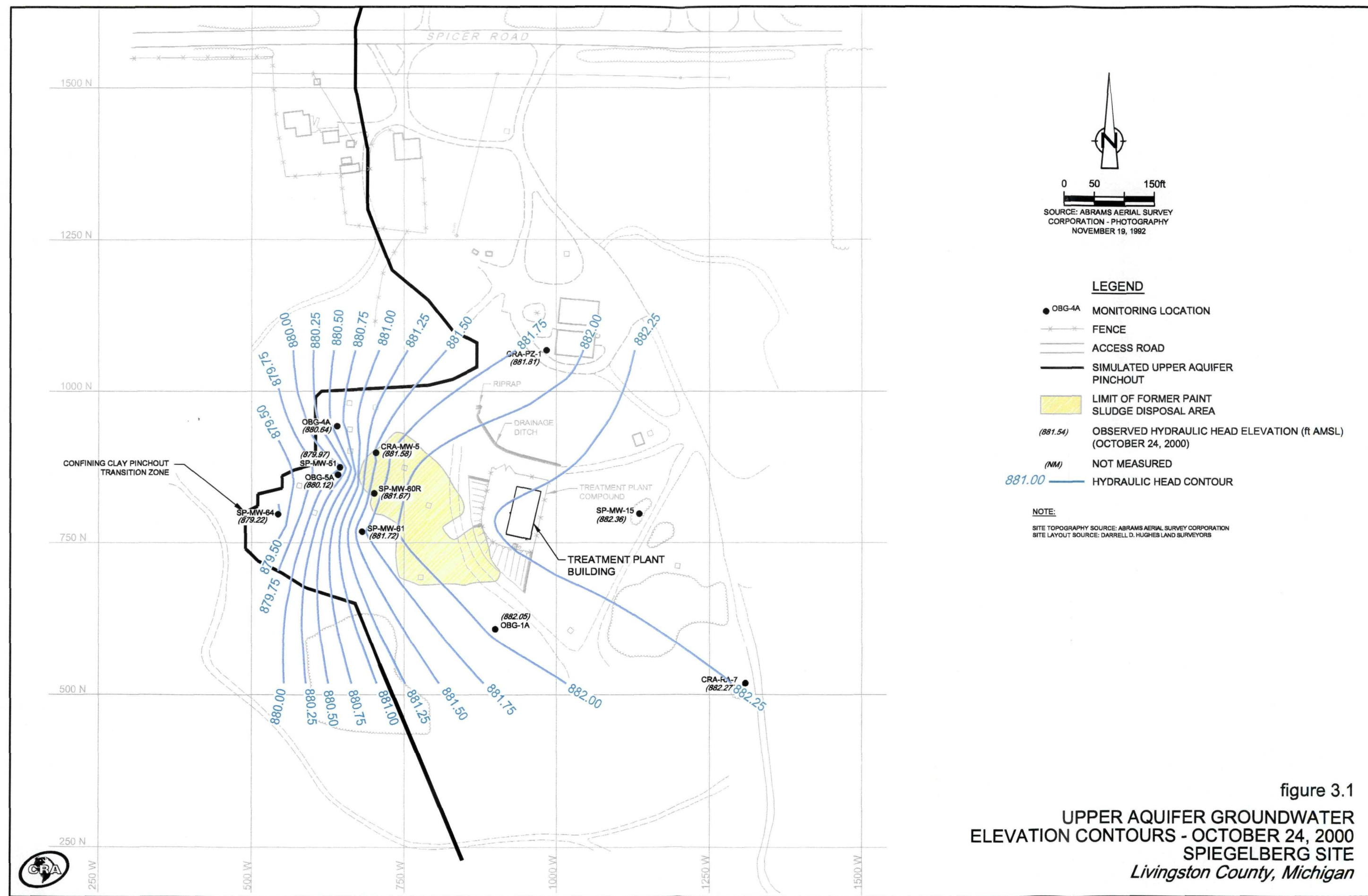


figure 3.1
UPPER AQUIFER GROUNDWATER
ELEVATION CONTOURS - OCTOBER 24, 2000
SPIEGELBERG SITE
Livingston County, Michigan

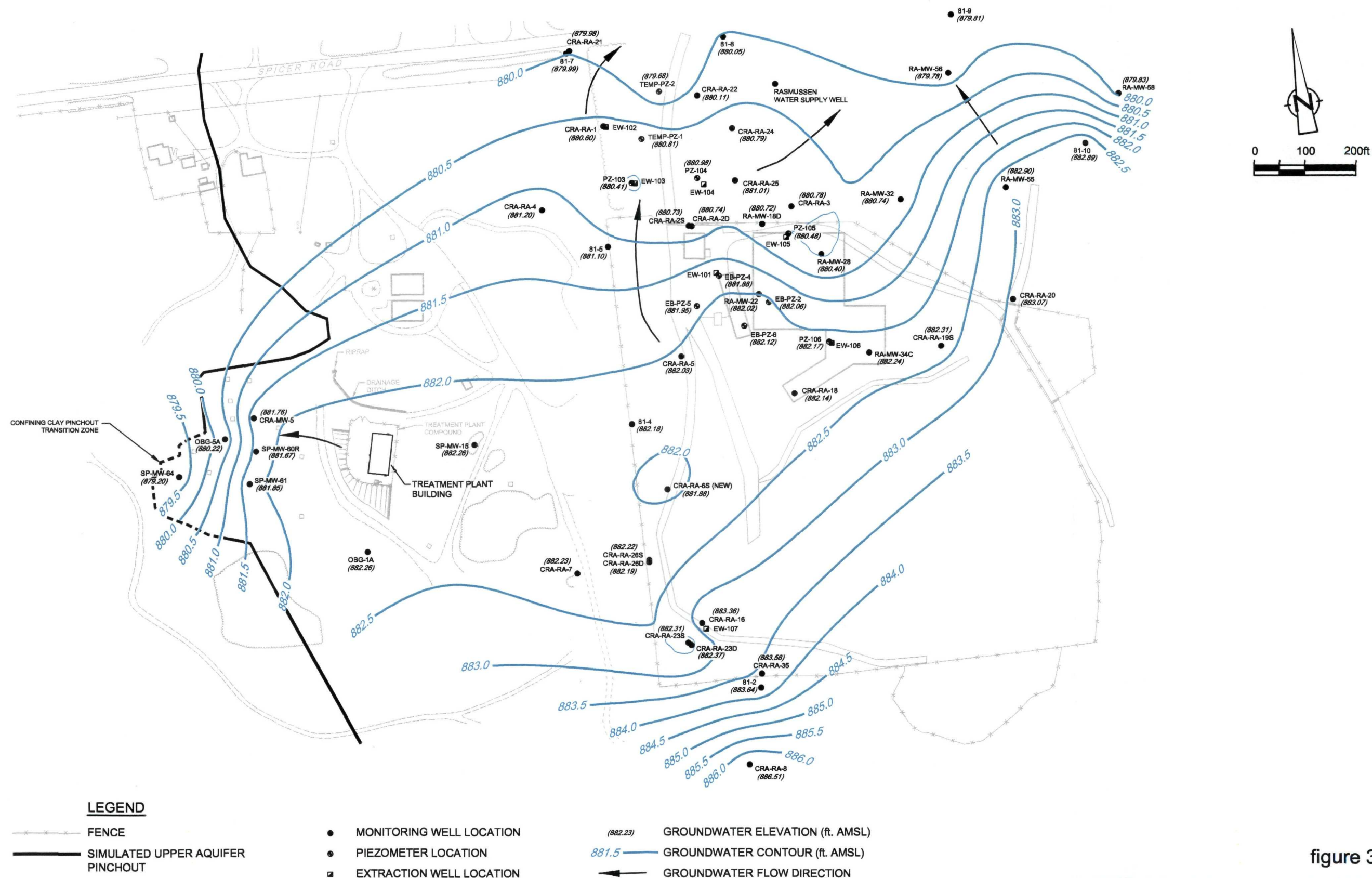


figure 3.2
 UPPER AQUIFER GROUNDWATER
 ELEVATION CONTOURS - OCTOBER 31, 2000
 SPIEGELBERG AND RASMUSSEN LANDFILL SITES
 Livingston County, Michigan

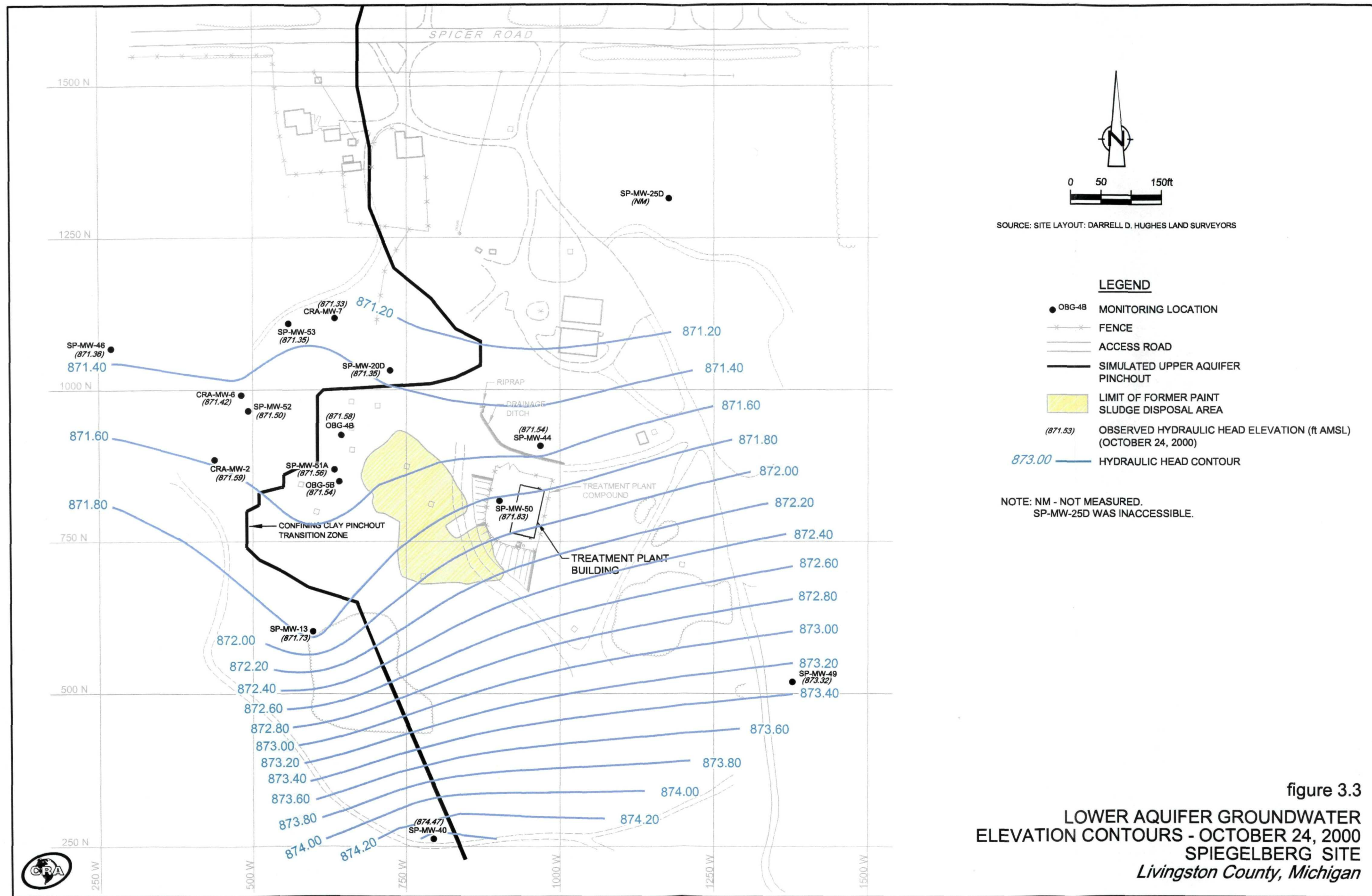


figure 3.3
LOWER AQUIFER GROUNDWATER
ELEVATION CONTOURS - OCTOBER 24, 2000
SPIEGELBERG SITE
Livingston County, Michigan

TABLES

TABLE 2.1

SUMMARY OF GROUNDWATER ELEVATION DATA - OCTOBER 2000
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN

<i>Upper Aquifer MW</i>	<i>Top of Riser Elevation (feet amsl)</i>	<i>24-Oct-00 Depth to Water (feet BTOR)</i>	<i>24-Oct-00 Water Level Elevation (feet amsl)</i>
CRA-RA-7	915.22	32.95	882.27
CRA-MW-5	907.6	26.02	881.58
CRA-PZ-1	932.95	51.14	881.81
OBG-1A	893.16	11.11	882.05
OBG-4A	912.69	32.05	880.64
OBG-5A	911.25	31.13	880.12
SP-MW-15	894.94	12.58	882.36
SP-MW-61	897.84	16.12	881.72
SP-MW-51	911.22	31.25	879.97
SP-MW-60R	905.18	23.51	881.67
SP-MW-64	922.15	42.93	879.22
<i>Lower Aquifer MW</i>	<i>Top of Riser Elevation (feet amsl)</i>	<i>24-Oct-00 Depth to Water (feet BTOR)</i>	<i>24-Oct-00 Water Level Elevation (feet amsl)</i>
SP-MW-52	951.2	79.7	871.5
SP-MW-53	940.36	69.01	871.35
OBG-4B	911.03	39.45	871.58
OBG-5B	911.33	39.79	871.54
SP-MW-13	940.06	68.33	871.73
SP-MW-20D	920.05	48.7	871.35
SP-MW-25D	930.23	NM	NM
SP-MW-40	918.33	43.86	874.47
SP-MW-44	920.09	48.55	871.54
SP-MW-46	952.6	81.24	871.36
SP-MW-49	915.64	42.32	873.32
SP-MW-50	912.1	40.27	871.83
SP-MW-51A	911.06	39.5	871.56
CRA-MW-2	954.48	82.89	871.59
CRA-MW-6	952.73	81.31	871.42
CRA-MW-7	939.98	68.65	871.33

Note:

NM - Not measured (see Section 3.1)

TABLE 2.2

SUMMARY OF GROUNDWATER ELEVATION DATA (JULY 1999 TO OCTOBER 2000)
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN

Monitoring Well ID	Top of Riser Elevation (feet amsl)	October-00			April-00			January-00			October-99			July-99		
		Depth to Water (feet BTOR)	Water Elevation (feet amsl)	Water Level	Depth to Water (feet BTOR)	Water Elevation (feet amsl)	Water Level	Depth to Water (feet BTOR)	Water Elevation (feet amsl)	Water Level	Depth to Water (feet BTOR)	Water Elevation (feet amsl)	Water Level			
Upper Aquifer																
CRA-RA-7	915.22	32.95	882.27	880.75	34.47	880.75	882.68	32.54	882.68	881.71	33.51	881.71	32.54	882.68	882.68	
CRA-MW-5	907.60	26.02	881.58	880.13	27.47	880.13	882.20	25.40	882.20	881.35	26.25	881.35	25.40	882.20	882.20	
CRA-PZ-1	932.95	51.14	881.81	880.35	52.60	880.35	882.40	50.55	882.40	881.54	51.41	881.54	50.55	882.40	882.40	
OBG-1A	893.16	11.11	882.05	880.43	12.73	880.43	882.61	10.55	882.61	881.60	11.56	881.60	10.55	882.61	882.61	
OBG-4A	912.69	32.05	880.64	878.97	33.72	878.97	881.20	31.49	881.20	NM	NM	NM	31.49	881.20	881.20	
OBG-5A	911.25	31.13	880.12	878.05	33.20	878.05	880.80	30.45	880.80	NM	NM	NM	30.45	880.80	880.80	
SP-MW-15	894.94	12.58	882.36	880.70	14.24	880.70	882.76	12.18	882.76	881.86	13.08	881.86	12.18	882.76	882.76	
SP-MW-61	897.84	16.12	881.72	880.13	17.71	880.13	882.20	15.64	882.20	881.32	16.52	881.32	15.64	882.20	882.20	
SP-MW-51	911.22	31.25	879.97	878.31	32.91	878.31	880.71	30.51	880.71	879.72	31.50	879.72	30.51	880.71	880.71	
SP-MW-60R	905.18	23.51	881.67	880.15	25.03	880.15	882.24	22.94	882.24	881.39	23.79	881.39	22.94	882.24	882.24	
SP-MW-64	922.15	42.93	879.22	877.77	44.38	877.77	NM	NM	NM	878.82	43.33	878.82	NM	NM	NM	
Lower Aquifer																
SP-MW-52	951.20	79.7	871.50	869.09	82.11	869.09	871.37	79.83	871.37	871.09	80.11	871.09	78.50	872.70	872.70	
SP-MW-53	940.36	69.01	871.35	871.01	69.35	871.01	871.26	69.10	871.26	871.80	68.56	871.80	67.80	872.56	872.56	
OBG-4B	911.03	39.45	871.58	871.18	39.85	871.18	871.51	39.52	871.51	872.14	38.89	872.14	38.29	872.74	872.74	
OBG-5B	911.33	39.79	871.54	871.18	40.15	871.18	871.53	39.80	871.53	871.99	39.34	871.99	38.70	872.63	872.63	
SP-MW-13	940.06	68.33	871.73	871.34	68.72	871.34	NM	NM	NM	872.10	67.96	872.10	67.15	872.91	872.91	
SP-MW-20D	920.05	48.7	871.35	871.05	49.00	871.05	871.33	48.72	871.33	871.85	48.20	871.85	47.54	872.51	872.51	
SP-MW-25D	930.23	NM	NM	870.71	59.52	870.71	871.13	59.10	871.13	871.47	58.76	871.47	58.03	872.20	872.20	
SP-MW-40	918.33	43.86	874.47	873.78	44.55	873.78	874.23	44.10	874.23	874.80	43.53	874.80	42.75	875.58	875.58	
SP-MW-44	920.09	48.55	871.54	871.09	49.00	871.09	871.48	48.61	871.48	871.97	48.12	871.97	47.41	872.68	872.68	
SP-MW-46	952.60	81.24	871.36	871.51	81.09	871.51	871.59	81.01	871.59	871.87	80.73	871.87	80.09	872.51	872.51	
SP-MW-49	915.64	42.32	873.32	872.72	42.92	872.72	NM	43.00	NM	873.60	42.04	873.60	NA	NM	NM	
SP-MW-50	912.10	40.27	871.83	871.62	40.48	871.62	871.82	40.28	871.82	872.34	39.76	872.34	39.83	872.27	872.27	
SP-MW-51A	911.06	39.5	871.56	871.25	31.81	871.25	NM	NM	NM	871.96	39.10	871.96	38.32	872.74	872.74	
CRA-MW-2	954.48	82.89	871.59	871.16	83.32	871.16	871.50	82.98	871.50	872.06	82.42	872.06	81.75	872.73	872.73	
CRA-MW-6	952.73	81.31	871.42	871.11	81.62	871.11	871.38	81.35	871.38	871.92	80.81	871.92	81.20	871.53	871.53	
CRA-MW-7	939.98	68.65	871.33	871.00	68.98	871.00	871.25	68.73	871.25	871.82	68.16	871.82	67.45	872.53	872.53	

TABLE 2.3

**SUMMARY OF UPPER AQUIFER GROUNDWATER ELEVATION DATA - OCTOBER 2000
SPIEGELBERG AND RASMUSSEN SITES
LIVINGSTON COUNTY, MICHIGAN**

<i>Upper Aquifer MW</i>	<i>Top of Riser Elevation</i>	<i>31-Oct-00 Depth to Water</i>	<i>31-Oct-00 Water Level Elevation</i>
81-10	915.88	32.99	882.89
81-2	905.72	22.08	883.64
81-4	912.44	30.26	882.18
81-5	915.77	34.67	881.1
81-7	926.99	47	879.99
81-8	924.08	44.03	880.05
81-9	896.6	16.79	879.81
CRA-MW-2	954.48	50.52	903.96
CRA-MW-5	907.6	25.84	881.76
CRA-MW-6	952.73	81.3	871.43
CRA-MW-7	939.98	68.66	871.32
CRA-PZ-1	932.95	51.1	881.85
CRA-RA-1	950.1	69.5	880.6
CRA-RA-16	941.94	58.58	883.36
CRA-RA-18	924.14	42	882.14
CRA-RA-19D	933.19	50.52	882.67
CRA-RA-19S	930.29	47.98	882.31
CRA-RA-20	942.15	59.08	883.07
CRA-RA-21	927.55	47.57	879.98
CRA-RA-22	934.51	54.4	880.11
CRA-RA-23D	915.75	33.38	882.37
CRA-RA-23S	915.98	33.67	882.31
CRA-RA-24	937.94	57.15	880.79
CRA-RA-25	935.48	54.47	881.01
CRA-RA-26D	932.511	50.32	882.191
CRA-RA-26S	932.399	50.18	882.219
CRA-RA-2D	937.14	56.4	880.74
CRA-RA-2S	936.83	56.1	880.73
CRA-RA-3	933.95	53.17	880.78
CRA-RA-35	907.87	24.29	883.58
CRA-RA-4	905.34	24.14	881.2
CRA-RA-5	937.24	55.21	882.03
CRA-RA-6S (OLD)	941.6	59.72	881.88
CRA-RA-7	915.22	32.99	882.23
CRA-RA-8	903.88	17.37	886.51
EB-PZ-2	922.76	40.7	882.06
EB-PZ-4	935.68	53.8	881.88
EB-PZ-5	937.45	55.5	881.95
EB-PZ-6	937.33	55.21	882.12
OBG-1A	893.16	10.9	882.26

TABLE 2.3

SUMMARY OF UPPER AQUIFER GROUNDWATER ELEVATION DATA - OCTOBER 2000
SPIEGELBERG AND RASMUSSEN SITES
LIVINGSTON COUNTY, MICHIGAN

<i>Upper Aquifer MW</i>	<i>Top of Riser Elevation</i>	<i>31-Oct-00 Depth to Water</i>	<i>31-Oct-00 Water Level Elevation</i>
OBG-4B	911.03	39.39	871.64
OBG-5A	911.25	31.03	880.22
OBG-5B	911.33	39.82	871.51
PZ-103	937.86	57.45	880.41
PZ-104	936.3	55.32	880.98
PZ-105	932.68	52.2	880.48
PZ-106	921.82	39.65	882.17
RA-19D	nm	nm	nm
RA-MW-18D	937.37	56.65	880.72
RA-MW-22	924.62	42.6	882.02
RA-MW-28	923.38	42.98	880.4
RA-MW-32	916.15	35.41	880.74
RA-MW-34C	924.39	42.15	882.24
RA-MW-35	nm	nm	nm
RA-MW-41	917.42	47.75	869.67
RA-MW-42	934.87	63.78	871.09
RA-MW-47	924.96	53.99	870.97
RA-MW-54	937.99	56.35	881.64
RA-MW-55	920.25	37.35	882.9
RA-MW-56	915.06	35.28	879.78
RA-MW-58	901.98	22.15	879.83
SP-MW-13	940.06	68.21	871.85
SP-MW-15	894.94	12.68	882.26
SP-MW-20D	920.05	48.53	871.52
SP-MW-25D	930.23	59.01	871.22
SP-MW-40	918.33	44	874.33
SP-MW-44	920.09	48.53	871.56
SP-MW-46	952.6	81.03	871.57
SP-MW-49	915.64	42.39	873.25
SP-MW-50	912.1	40.23	871.87
SP-MW-51A	911.06	59.54	851.52
SP-MW-52	951.2	79.65	871.55
SP-MW-53	940.36	68.96	871.4
SP-MW-60R	905.18	23.51	881.67
SP-MW-61	897.84	15.99	881.85
SP-MW-64	922.15	42.95	879.2
SP-MW-64A	922.1	50.24	871.86
TEMP-PZ-1	937.69	56.88	880.81
TEMP-PZ-2	933.29	53.61	879.68

TABLE 2.4
SUMMARY OF WELL PURGE DATA - OCTOBER 2000
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN

<i>Upper Aquifer</i> <i>MW</i>	<i>pH</i>	<i>temperature</i> <i>(degrees C)</i>	<i>Conductivity</i> <i>(uS/cm)</i>	<i>ORP</i> <i>(mV)</i>	<i>DO</i> <i>(mg/L)</i>	<i>Turbidity</i> <i>(NTU)</i>	<i>Aesthetics</i>
CRA-MW-5	6.9300	16.2600	0.7570	207.0000	2.3300	4.0000	clear, odorless
OBG-4A	7.1900	13.8000	0.5690	320.0000	2.3500	8.0000	no observations recorded.
SP-MW-60R	7.0600	14.2900	0.4690	-183.0000	0.5400	5.0000	no observations recorded.
 <i>Lower Aquifer</i> <i>MW</i>	 <i>pH</i>	 <i>temperature</i> <i>(degrees C)</i>	 <i>Conductivity</i> <i>(uS/cm)</i>	 <i>ORP</i> <i>(mV)</i>	 <i>DO</i> <i>(mg/L)</i>	 <i>Turbidity</i> <i>(NTU)</i>	 <i>Aesthetics</i>
OBG-4B	7.0900	12.4100	0.5700	195.0000	2.3300	10.0000	no observations recorded.
SP-MW-20D	7.6000	15.3300	0.5470	142.0000	0.6300	4.5000	no observations recorded.
SP-MW-51A	7.8700	13.3600	0.4160	311.0000	2.7300	4.0000	clear, odorless
CRA-MW-6	7.2100	12.8100	0.4930	281.0000	1.5400	6.0000	no observations recorded.
CRA-MW-7	7.0900	12.4700	0.6030	289.0000	3.3400	9.0000	clear, odorless

TABLE 2.5
GROUNDWATER SAMPLE IDENTIFICATION KEY
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN
OCTOBER 24-25, 2000

<i>Well Identification</i>	<i>Sample Identification Number</i>	<i>QA/QC</i>	<i>Parameters</i>
SP-MW-60R	GW-3581-102400-BW-037		TAL VOCs
CRA-MW-5	GW-3581-102400-BW-038		TAL VOCs
CRA-MW-6	GW-3581-102400-BW-039		TAL VOCs
CRA-MW-7	GW-3581-102400-BW-040		TAL VOCs
SP-MW-20D	GW-3581-102400-BW-041		TAL VOCs
SP-MW-51A	GW-3581-102400-BW-042	MS/MSD	TAL VOCs
OBG-4B	GW-3581-102400-BW-043		TAL VOCs
OBG-4B	GW-3581-102400-BW-044	duplicate	TAL VOCs
OBG-4A	GW-3581-102400-BW-045		TAL VOCs
SP-MW-51	GW-3581-102400-BW-046		TAL VOCs

TABLE 3.1
CHEMICAL MONITORING NETWORK WELL CLASSIFICATION
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN

<i>Aquifer</i>	<i>Monitoring Well</i>	<i>Purpose</i>
Upper	SP-MW-51	Source Area Well
	SP-MW-60R	Source Area Well
	CRA-MW-5	Source Area Well
	OBG-4A	Source Area Well
Lower	SP-MW-51A	Source Area Well
	OBG-4B	Source Area Well
	SP-MW-20D	Sentry Well
	CRA-MW-6	Sentry Well
	CRA-MW-7	Sentry Well

TABLE 3.2
ANALYTICAL RESULTS SUMMARY - UPPER AQUIFER
OCTOBER 2000 GROUNDWATER MONITORING EVENT
INTERMITTENT OPERATION OF GROUNDWATER REMEDIATION SYSTEM
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN

Page 1 (a)
Date Printed: December 6, 2000
Time Printed: 3:37 pm

<i>Sample Location:</i>	CRA-MW5	OBG-4A	SP-MW-51	SP-MW-60R
<i>Sample ID:</i>	GW-BW-038	GW-BW-045	GW-BW-046	GW-BW-037
<i>Sample Date:</i>	10/24/2000	10/25/2000	10/25/2000	10/24/2000

Parameters	Units	Part 201
------------	-------	----------

Volatile Organics

1,1,1-TRICHLOROETHANE	ug/L	200	ND(1.0)	15	ND(1.0)	ND(1.0)
1,1,2,2-TETRACHLOROETHANE	ug/L	8.5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,2-TRICHLOROETHANE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1-DICHLOROETHANE	ug/L	880	ND(1.0)	1.0	ND(1.0)	2.7
1,1-DICHLOROETHENE	ug/L	7.0	ND(1.0)	1.1	ND(1.0)	ND(1.0)
1,2-DICHLOROETHANE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,2-DICHLOROPROPANE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
2-BUTANONE (MEK)	ug/L	13000	ND(10)	ND(10)	ND(10)	ND(10)
2-HEXANONE	ug/L	1000	ND(10)	ND(10)	ND(10)	ND(10)
4-METHYL-2-PENTANONE	ug/L	1800	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
ACETONE	ug/L	730	ND(10)	ND(10)	ND(10)	ND(10)
BENZENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BROMODICHLOROMETHANE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BROMOFORM	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BROMOMETHANE	ug/L	10	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CARBON TETRACHLORIDE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROBENZENE	ug/L	100	1.8	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROETHANE	ug/L	430	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CHLOROFORM	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROMETHANE	ug/L	260	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CIS-1,2-DICHLOROETHENE	ug/L	70	ND(0.50)	ND(0.50)	ND(0.50)	1.6
CIS-1,3-DICHLOROPROPENE	ug/L	21	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
DIBROMOCHLOROMETHANE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
ETHYLBENZENE	ug/L	74	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
METHYLENE CHLORIDE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
STYRENE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TETRACHLOROETHENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TRANS-1,2-DICHLOROETHENE	ug/L	100	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
TRANS-1,3-DICHLOROPROPENE	ug/L	21	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TRICHLOROETHENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
VINYL CHLORIDE	ug/L	2.0	2.0	ND(2.0)	ND(2.0)	ND(2.0)
XYLENES (TOTAL)	ug/L	280	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)

Notes

- ND() - Not detected at or above the quantitation limit listed in parentheses.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
- J - Estimated.
- UJ - The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
- Part 201 - Michigan Part 201 Residential Generic Criteria for groundwater based on OpMemo #18 table revised May 1999, as obtained from the MDEQ website (<http://www.deq.state.mi.us/erd/opmemos/opmemo18>) on November 16, 1999. For 1,3-Dichloropropene, the sum of isomers must not exceed 4.7 ug/L.

TABLE 3.3
ANALYTICAL RESULTS SUMMARY - LOWER AQUIFER
OCTOBER 2000 GROUNDWATER MONITORING EVENT
INTERMITTENT OPERATION OF GROUNDWATER REMEDIATION SYSTEM
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN

Page 1 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

Sample Location:	CRA-MW6	CRA-MW7	OBG-4B	OBG-4B	SP-MW-20D	SP-MW-51A
Sample ID:	GW-BW-039	GW-BW-040	GW-BW-043	GW-BW-044	GW-BW-041	GW-BW-042
Sample Date:	10/24/2000	10/24/2000	10/25/2000	10/25/2000	10/24/2000	10/25/2000
				Dupl.		
Parameters	Units	Part 201				
<u>Volatile Organics</u>						
1,1,1-TRICHLOROETHANE	ug/L	200	ND(1.0)	ND(1.0)	3.2	ND(1.0)
1,1,2,2-TETRACHLOROETHANE	ug/L	8.5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,2-TRICHLOROETHANE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1-DICHLOROETHANE	ug/L	880	ND(1.0)	41	1.4	ND(1.0)
1,1-DICHLOROETHENE	ug/L	7.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,2-DICHLOROETHANE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,2-DICHLOROPROPANE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
2-BUTANONE (MEK)	ug/L	13000	ND(10)	ND(10)	ND(10)	ND(10)
2-HEXANONE	ug/L	1000	ND(10)	ND(10)	ND(10)	ND(10)
4-METHYL-2-PENTANONE	ug/L	1800	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
ACETONE	ug/L	730	ND(10)	ND(10)	ND(10)	ND(10)
BENZENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BROMODICHLOROMETHANE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BROMOFORM	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BROMOMETHANE	ug/L	10	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CARBON TETRACHLORIDE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROBENZENE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROETHANE	ug/L	430	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CHLOROFORM	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROMETHANE	ug/L	260	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CIS-1,2-DICHLOROETHENE	ug/L	70	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
CIS-1,3-DICHLOROPROPENE	ug/L	21	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
DIBROMOCHLOROMETHANE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
ETHYLBENZENE	ug/L	74	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
METHYLENE CHLORIDE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
STYRENE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TETRACHLOROETHENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TRANS-1,2-DICHLOROETHENE	ug/L	100	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
TRANS-1,3-DICHLOROPROPENE	ug/L	21	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TRICHLOROETHENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
XYLENES (TOTAL)	ug/L	280	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)

Notes

- ND() - Not detected at or above the quantitation limit listed in parentheses.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
- J - Estimated.
- UJ - The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
- Part 201 - Michigan Part 201 Residential Generic Criteria for groundwater based on OpMemo #18 table revised May 1999, as obtained from the MDEQ website (<http://www.deq.state.mi.us/erd/opmemos/opmemo18>) on November 16, 1999. For 1,3-Dichloropropene, the sum of isomers must not exceed 4.7 ug/L.

TABLE 3.4

Page 1 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

**SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA
(JULY 1999 TO OCTOBER 2000) - UPPER AQUIFER
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

Sample Location:	CRA-MW5	CRA-MW5	CRA-MW5	CRA-MW5	CRA-MW5	CRA-MW5	CRA-MW5	CRA-MW5	OBG-4A
Sample ID:	GW-BW-005	GW101399-BW-015	W-BW-022	W-BW-023	GW-BW-032	GW-BW-033	GW-BW-038	GW-BW-010	
Sample Date:	07/07/1999	10/14/1999	01/18/2000	01/18/2000	04/12/2000	04/12/2000	10/24/2000	07/08/1999	
	Dupl.		Dupl.		Dupl.		Dupl.		
Parameters	Units	Part 201							
<u>General Chemistry</u>									
CONDUCTIVITY, TOTAL	mS/cm	--	0.412	0.377	0.454	--	4.37	--	0.364
DISSOLVED NITRATE	mg/L	--	--	--	--	--	0.16	0.14	--
DISSOLVED OXYGEN, TOTAL	mg/L	--	0.85	0.61	1.92	--	1.79	--	7.91
DISSOLVED SULFATE	mg/L	--	--	--	--	--	36.2	36.2	--
OXIDATION-REDUCTION POTENTIAL	mV	--	-81.9	-106.2	-64.9	--	-65.9	--	225.2
PH (LABORATORY/FIELD)	su	--	7.03	7.22	6.68	--	7.1	--	7.22
TEMPERATURE, TOTAL	Deg. C	--	12.64	11.52	11.13	--	11.61	--	14.72
TURBIDITY, TOTAL	NTU	--	2.2	1.5	5	--	5	--	4.8
<u>Metals</u>									
IRON, DISSOLVED (FIELD)	mg/L	--	--	--	--	--	0.6	--	--
IRON, DISSOLVED (LABORATORY)	mg/L	--	--	--	--	--	2.4	2.7	--
<u>Volatile Organics</u>									
1,1,1-TRICHLOROETHANE	ug/L	200	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	10
1,1-DICHLOROETHANE	ug/L	880	0.25 J	ND(1.0)	ND(1.0)	ND(1.0)	1.2	1.4	0.70 J
1,1-DICHLOROETHENE	ug/L	7.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BENZENE	ug/L	5.0	0.27 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROBENZENE	ug/L	100	1.5	1.6	1.7	1.8	1.8	1.5	ND(1.0)
CHLOROETHANE	ug/L	430	0.31 J	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CIS-1,2-DICHLOROETHENE	ug/L	70	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
METHANE	ug/L	--	--	--	--	--	430	370	--
TETRACHLOROETHENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.15 J
TOLUENE	ug/L	790	0.17 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TRANS-1,2-DICHLOROETHENE	ug/L	100	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)

TABLE 3.4

Page 2 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

**SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA
(JULY 1999 TO OCTOBER 2000) - UPPER AQUIFER
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

<i>Sample Location:</i>			OBG-4A	OBG-4A	OBG-5A	SP-MW-51	SP-MW-51	SP-MW-60R	SP-MW-60R	SP-MW-60R
<i>Sample ID:</i>			GW101399-BW-020	GW-BW-045	GW-BW-009	GW101399-BW-018	GW-BW-046	GW-BW-004	GW101399-BW-014	W-BW-021
<i>Sample Date:</i>			10/14/1999	10/25/2000	07/08/1999	10/14/1999	10/25/2000	07/07/1999	10/13/1999	01/18/2000
<u>Parameters</u>	<u>Units</u>	<u>Part 201</u>								
<u>General Chemistry</u>										
CONDUCTIVITY, TOTAL	mS/cm	--	0.355	--	0.543	0.546	--	0.576	0.451	0.409
DISSOLVED NITRATE	mg/L	--	--	--	--	--	--	--	--	--
DISSOLVED OXYGEN, TOTAL	mg/L	--	7.48	--	0.98	1.13	--	0.92	0.73	2
DISSOLVED SULFATE	mg/L	--	--	--	--	--	--	--	--	--
OXIDATION-REDUCTION POTENTIAL	mV	--	151.1	--	-139.1	-125.2	--	-45.7	-95.8	-70.3
PH (LABORATORY/FIELD)	su	--	7.33	--	7.11	7.22	--	6.96	6.99	6.68
TEMPERATURE, TOTAL	Deg. C	--	13.77	--	14.7	14.39	--	14.12	11.0	10.24
TURBIDITY, TOTAL	NTU	--	2	--	68.3	8.5	--	1.6	8	5
<u>Metals</u>										
IRON, DISSOLVED (FIELD)	mg/L	--	--	--	--	--	--	--	--	--
IRON, DISSOLVED (LABORATORY)	mg/L	--	--	--	--	--	--	--	--	--
<u>Volatile Organics</u>										
1,1,1-TRICHLOROETHANE	ug/L	200	12	15	ND(1.0)	ND(1.0) UJ	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1-DICHLOROETHANE	ug/L	880	3.3	1.0	0.44 J	ND(1.0) UJ	ND(1.0)	4.3	4.3	4.9
1,1-DICHLOROETHENE	ug/L	7.0	1.2	1.1	ND(1.0)	ND(1.0) UJ	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BENZENE	ug/L	5.0	ND(1.0)	ND(1.0)	0.36 J	ND(1.0) UJ	ND(1.0)	0.42 J	ND(1.0)	ND(1.0)
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)	0.18 J	ND(1.0) UJ	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROBENZENE	ug/L	100	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0) UJ	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROETHANE	ug/L	430	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0) UJ	ND(2.0)	0.54 J	ND(2.0)	3.0
CIS-1,2-DICHLOROETHENE	ug/L	70	ND(0.50)	ND(0.50)	0.13 J	ND(0.50) UJ	ND(0.50)	2.1	2.4	2.2
METHANE	ug/L	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	ug/L	5.0	ND(1.0)	ND(1.0)	0.14 J	ND(1.0) UJ	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0) UJ	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
TRANS-1,2-DICHLOROETHENE	ug/L	100	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50) UJ	ND(0.50)	0.19 J	ND(0.50)	ND(0.50)
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0) UJ	ND(2.0)	0.36 J	ND(2.0)	ND(2.0)

TABLE 3.4

**SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA
(JULY 1999 TO OCTOBER 2000) - UPPER AQUIFER
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

Page 3 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

Sample Location:	SP-MW-60R	SP-MW-60R
Sample ID:	GW-BW-031	GW-BW-037
Sample Date:	04/11/2000	10/24/2000

Parameters	Units	Part 201		
<u>General Chemistry</u>				
CONDUCTIVITY, TOTAL	mS/cm	--	2.9	--
DISSOLVED NITRATE	mg/L	--	ND(0.10)	--
DISSOLVED OXYGEN, TOTAL	mg/L	--	1.42	--
DISSOLVED SULFATE	mg/L	--	19.4	--
OXIDATION-REDUCTION POTENTIAL	mV	--	-85.2	--
PH (LABORATORY/FIELD)	su	--	7.15	--
TEMPERATURE, TOTAL	Deg. C	--	10.9	--
TURBIDITY, TOTAL	NTU	--	3	--
<u>Metals</u>				
IRON, DISSOLVED (FIELD)	mg/L	--	3.6	--
IRON, DISSOLVED (LABORATORY)	mg/L	--	5.5	--
<u>Volatile Organics</u>				
1,1,1-TRICHLOROETHANE	ug/L	200	ND(1.0)	ND(1.0)
1,1-DICHLOROETHANE	ug/L	880	4.5	2.7
1,1-DICHLOROETHENE	ug/L	7.0	ND(1.0)	ND(1.0)
BENZENE	ug/L	5.0	ND(1.0)	ND(1.0)
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)
CHLOROBENZENE	ug/L	100	ND(1.0)	ND(1.0)
CHLOROETHANE	ug/L	430	ND(2.0)	ND(2.0)
CIS-1,2-DICHLOROETHENE	ug/L	70	1.8	1.6
METHANE	ug/L	--	67	--
TETRACHLOROETHENE	ug/L	5.0	ND(1.0)	ND(1.0)
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)
TRANS-1,2-DICHLOROETHENE	ug/L	100	ND(0.50)	ND(0.50)
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)

MNA

Notes

- ND() - Not detected at or above the quantitation limit listed in parentheses.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
- J - Estimated.
- UJ - The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
- Part 201 - Michigan Part 201 Residential Generic Criteria for groundwater based on OpMemo #18 table revised May 1999, as obtained from the MDEQ website (<http://www.deq.state.mi.us/erd/opmemos/opmemo18>) on November 16, 1999. For 1,3-Dichloropropene, the sum of isomers must not exceed 4.7 ug/L.

TABLE 3.5

Page 1 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

**SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA
(JULY 1999 TO OCTOBER 2000) LOWER AQUIFER
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

<i>Sample Location:</i>			CRA-MW6	CRA-MW6	CRA-MW6	CRA-MW6	CRA-MW6	CRA-MW6	CRA-MW6
<i>Sample ID:</i>			GW-BW-001	GW-BW-002	GW101399-BW-011	GW101399-BW-012	W-BW-026	GW-BW-030	GW-BW-039
<i>Sample Date:</i>			07/07/1999	07/07/1999	10/13/1999	10/13/1999	01/19/2000	04/11/2000	10/24/2000
				Dupl.		Dupl.			
<u>Parameters</u>	<u>Units</u>	<u>Part 201</u>							
<u>General Chemistry</u>									
CONDUCTIVITY, TOTAL	mS/cm	--	0.470	--	0.361	--	0.343	2.63	--
DISSOLVED OXYGEN, TOTAL	mg/L	--	9.74	--	3.76	--	4.08	1.08	--
DISSOLVED SULFATE	mg/L	--	--	--	--	--	--	38.9	--
OXIDATION-REDUCTION POTENTIAL	mV	--	207.1	--	177.5	--	144	23.9	--
PH (LABORATORY/FIELD)	su	--	7.21	--	7.29	--	6.96	7.38	--
TEMPERATURE, TOTAL	Deg. C	--	11.71	--	10.57	--	8.67	9.39	--
TURBIDITY, TOTAL	NTU	--	0.9	--	10.4	--	3	2	--
<u>Metals</u>									
IRON, DISSOLVED (FIELD)	mg/L	--	--	--	--	--	--	0.7	--
IRON, DISSOLVED (LABORATORY)	mg/L	--	--	--	--	--	--	0.13	--
LEAD, TOTAL	mg/L	--	--	--	--	--	--	ND(0.0030)	--
<u>Volatile Organics</u>									
1,1,1-TRICHLOROETHANE	ug/L	200	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1-DICHLOROETHANE	ug/L	880	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
BENZENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CARBON DISULFIDE	ug/L	800	0.11 J	0.12 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROETHANE	ug/L	430	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CIS-1,2-DICHLOROETHENE	ug/L	70	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
METHANE	ug/L	--	--	--	--	--	--	0.74	--
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)

TABLE 3.5

**SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA
(JULY 1999 TO OCTOBER 2000) LOWER AQUIFER
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

Page 2 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

<i>Sample Location:</i>			CRA-MW7	CRA-MW7	CRA-MW7	CRA-MW7	CRA-MW7	OBG-4B	OBG-4B
<i>Sample ID:</i>			GW-BW-003	GW101399-BW-013	W-BW-025	GW-BW-029	GW-BW-040	GW-BW-008	GW101399-BW-019
<i>Sample Date:</i>			<u>07/07/1999</u>	<u>10/13/1999</u>	<u>01/19/2000</u>	<u>04/11/2000</u>	<u>10/24/2000</u>	<u>07/08/1999</u>	<u>10/14/1999</u>
<u>Parameters</u>	<u>Units</u>	<u>Part 201</u>							
<u>General Chemistry</u>									
CONDUCTIVITY, TOTAL	mS/cm	--	0.550	0.470	0.439	4.29	--	0.437	0.380
DISSOLVED OXYGEN, TOTAL	mg/L	--	4.25	1.1	4.55	0.87	--	0.88	1.03
DISSOLVED SULFATE	mg/L	--	--	--	--	34.0	--	--	--
OXIDATION-REDUCTION POTENTIAL	mV	--	63.9	98.3	182.1	28.4	--	-107	-96.7
PH (LABORATORY/FIELD)	su	--	7.24	7.12	6.79	7.23	--	7.11	7.15
TEMPERATURE, TOTAL	Deg.C	--	12.6	10.95	8.81	9.08	--	13.45	12.7
TURBIDITY, TOTAL	NTU	--	1.1	1	4	2	--	5	8
<u>Metals</u>									
IRON, DISSOLVED (FIELD)	mg/L	--	--	--	--	ND(0.10)	--	--	--
IRON, DISSOLVED (LABORATORY)	mg/L	--	--	--	--	0.18	--	--	--
LEAD, TOTAL	mg/L	--	--	--	--	ND(0.0030)	--	--	--
<u>Volatile Organics</u>									
1,1,1-TRICHLOROETHANE	ug/L	200	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0) UJ
1,1-DICHLOROETHANE	ug/L	880	19	28	33	38	41	0.55 J	1.2 J
BENZENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0) UJ
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.25 J	ND(1.0) UJ
CHLOROETHANE	ug/L	430	0.58 J	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0) UJ
CIS-1,2-DICHLOROETHENE	ug/L	70	0.16 J	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50) UJ
METHANE	ug/L	--	--	--	--	36	--	--	--
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.38 J	ND(1.0) UJ
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0) UJ

TABLE 3.5

Page 3 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

**SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA
(JULY 1999 TO OCTOBER 2000) LOWER AQUIFER
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

<i>Sample Location:</i>			OBG-4B	OBG-4B	OBG-4B	OBG-4B	SP-MW-20D	SP-MW-20D	SP-MW-20D
<i>Sample ID:</i>			W-BW-028	GW-BW-035	GW-BW-043	GW-BW-044	GW-BW-006	GW101399-BW-016	W-BW-027
<i>Sample Date:</i>			01/19/2000	04/12/2000	10/25/2000	10/25/2000	07/07/1999	10/14/1999	01/19/2000
						Dupl.			
<u>Parameters</u>	<u>Units</u>	<u>Part 201</u>							
<u>General Chemistry</u>									
CONDUCTIVITY, TOTAL	mS/cm	--	0.365	3	--	--	0.385	0.424	0.361
DISSOLVED OXYGEN, TOTAL	mg/L	--	1.91	1.36	--	--	0.86	1.31	1.97
DISSOLVED SULFATE	mg/L	--	--	26.4	--	--	--	--	--
OXIDATION-REDUCTION POTENTIAL	mV	--	-91.9	-94.2	--	--	-229.5	-114.4	-141
PH (LABORATORY/FIELD)	su	--	6.84	7.23	--	--	8.02	7.52	7.26
TEMPERATURE, TOTAL	Deg. C	--	9.44	11.47	--	--	13.52	12.21	8.11
TURBIDITY, TOTAL	NTU	--	5	8	--	--	3.6	7	2
<u>Metals</u>									
IRON, DISSOLVED (FIELD)	mg/L	--	--	0.7	--	--	--	--	--
IRON, DISSOLVED (LABORATORY)	mg/L	--	--	1.9	--	--	--	--	--
LEAD, TOTAL	mg/L	--	--	ND(0.0030)	--	--	--	--	--
<u>Volatile Organics</u>									
1,1,1-TRICHLOROETHANE	ug/L	200	4.2	ND(1.0)	3.2	3.2	ND(1.0)	ND(1.0)	ND(1.0)
1,1-DICHLOROETHANE	ug/L	880	ND(1.0)	ND(1.0)	1.4	1.4	ND(1.0)	ND(1.0)	ND(1.0)
BENZENE	ug/L	5.0	1.6	1.0	ND(1.0)	ND(1.0)	0.14 J	ND(1.0)	ND(1.0)
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROETHANE	ug/L	430	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CIS-1,2-DICHLOROETHENE	ug/L	70	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
METHANE	ug/L	--	--	34	--	--	--	--	--
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	0.18 J	ND(1.0)	ND(1.0)
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	0.87 J	ND(2.0)	ND(2.0)

MNA

TABLE 3.5

Page 4 (a)

Date Printed: December 6, 2000

Time Printed: 3:37 pm

**SUMMARY OF LONG-TERM MONITORING PLAN ANALYTICAL DATA
(JULY 1999 TO OCTOBER 2000) LOWER AQUIFER
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

<i>Sample Location:</i>			SP-MW-20D	SP-MW-20D	SP-MW-51A	SP-MW-51A	SP-MW-51A	SP-MW-51A	SP-MW-51A
<i>Sample ID:</i>			GW-BW-036	GW-BW-041	GW-BW-007	GW101399-BW-017	W-BW-024	GW-BW-034	GW-BW-042
<i>Sample Date:</i>			04/12/2000	10/24/2000	07/08/1999	10/14/1999	01/18/2000	04/12/2000	10/25/2000
<u>Parameters</u>	<u>Units</u>	<u>Part 201</u>							
<u>General Chemistry</u>									
CONDUCTIVITY, TOTAL	mS/cm	--	3.33	--	0.499	0.421	0.344	3.1	--
DISSOLVED OXYGEN, TOTAL	mg/L	--	1.61	--	4.48	0.82	1.96	2.01	--
DISSOLVED SULFATE	mg/L	--	70.6	--	--	--	--	30.4	--
OXIDATION-REDUCTION POTENTIAL	mV	--	-154.9	--	-114.6	-127	-61.4	-119.1	--
PH (LABORATORY/FIELD)	su	--	7.64	--	7.34	7.42	7.05	7.38	--
TEMPERATURE, TOTAL	Deg. C	--	11.2	--	13.24	12.3	6.7	11.08	--
TURBIDITY, TOTAL	NTU	--	5	--	94	31	5	5	--
<u>Metals</u>									
IRON, DISSOLVED (FIELD)	mg/L	--	ND(0.10)	--	--	--	--	0.7	--
IRON, DISSOLVED (LABORATORY)	mg/L	--	1.1	--	--	--	--	1.6	--
LEAD, TOTAL	mg/L	--	ND(0.0030)	--	--	--	--	0.0033	--
<u>Volatile Organics</u>									
1,1,1-TRICHLOROETHANE	ug/L	200	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1-DICHLOROETHANE	ug/L	880	ND(1.0)	ND(1.0)	4.1	7.8	5.8	5.6	4.7
BENZENE	ug/L	5.0	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	1.5	ND(1.0)
CARBON DISULFIDE	ug/L	800	ND(1.0)	ND(1.0)	0.39 J	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
CHLOROETHANE	ug/L	430	ND(2.0)	ND(2.0)	2.4	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
CIS-1,2-DICHLOROETHENE	ug/L	70	ND(0.50)	ND(0.50)	0.28 J	0.64	ND(0.50)	0.58	ND(0.50)
METHANE	ug/L	--	890	--	--	--	--	120	--
TOLUENE	ug/L	790	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
VINYL CHLORIDE	ug/L	2.0	ND(2.0)	ND(2.0)	1.9 J	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)

Notes

- ND() - Not detected at or above the quantitation limit listed in parentheses.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
- J - Estimated.
- UJ - The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
- Part 201 - Michigan Part 201 Residential Generic Criteria for groundwater based on OpMemo #18 table revised May 1999, as obtained from the MDEQ website (<http://www.deq.state.mi.us/erd/opmemos/opmemo18>) on November 16, 1999. For 1,3-Dichloropropene, the sum of isomers must not exceed 4.7 ug/L.

APPENDIX A

CONTINGENCY PLAN

APPENDIX A

CONTINGENCY PLAN

The following section presents the proposed contingency measures and the conditions under which these would be triggered.

At this Site, the operation of the groundwater remediation system has resulted in an excellent understanding of the hydraulic response of the Upper Aquifer and Lower Aquifer to pumping and re-injection. Also, the rate of groundwater flow in the Lower Aquifer downgradient of the former source area is very slow (approximately 3.1 feet/year). Therefore, sufficient time is available to evaluate chemical monitoring data prior to implementing any contingency measures.

The existing groundwater remediation system will be maintained in working condition during the intermittent pumping period. The contingency remedy for the Site will be the operation of all or part of the existing groundwater remediation system should this be required. This system is already constructed and its operation could readily be initiated should Site conditions warrant.

Groundwater monitoring data from the RI and RD (i.e., prior to the remedial action) showed that even though some compound concentrations in the former source area exceeded MDEQ Part 201 residential cleanup criteria, there was no downgradient impact. This fact was supported by the fate and transport analysis for vinyl chloride presented in the petition for intermittent operation (CRA, February 1988). This conservative evaluation showed that even if a constant source of vinyl chloride of 17 µg/L was assumed, migration beyond 150 feet would not occur. Based on this measured and predictive evidence, it is not necessary to compare Site monitoring data to MDEQ Part 201 residential cleanup criteria to determine the need for contingency measures. It is appropriate to develop trigger concentrations for critical compounds in the former source area against which Site monitoring data will be compared.

For the evaluation of the need for contingency measures, vinyl chloride and benzene are the sentinel compounds. These compounds are SOW-targeted compounds and represent the chlorinated and aromatic VOC groups. Vinyl chloride was historically detected in a number of Site monitoring wells. However, since 1997 vinyl chloride has only been detected in Lower Aquifer monitoring well SP-MW-51A. During 1997, three rounds of sampling were performed on this well. The results of these analyses showed the following concentrations of vinyl chloride: 7 µg/L (May 1997); 6 µg/L in the investigative and duplicate samples (July 1997); 4 µg/L (October 1997); and, non-detect

(April 1998). The average of the four samples with detectable concentrations collected during the three events is approximately 6 µg/L. The presence of these concentrations of vinyl chloride did not result in any downgradient detections. Therefore, it is proposed that 6 µg/L be used as a trigger concentration for vinyl chloride in the source area monitoring wells.

Benzene was historically detected in the Site groundwater. However, during 1997 benzene was not detected in any Site monitoring wells. It is proposed that the trigger concentration for benzene be set at 5 µg/L (equivalent to the MDEQ Part 201 residential cleanup criterion) in all monitoring wells.

For the proposed downgradient sentry monitoring wells, any exceedance of the MDEQ Part 201 residential cleanup criteria will trigger the evaluation of contingencies.

The need for any contingency actions will be based on the following procedure:

1. Site analytical data will be compared to the trigger concentrations. If there are no exceedances, the evaluation will cease. If an exceedance is noted, notify USEPA and MDEQ and proceed to Step 2.
2. Within 60 days of the receipt of the results of the sample event in Step 1, two duplicate groundwater samples will be collected from the monitoring well(s) in which the exceedance occurred. If the re-sampling event does not confirm the exceedance, the evaluation will cease. If the exceedance of the trigger concentration is confirmed, proceed to Step 3.
3. If the exceedance is confirmed, a report will be prepared recommending appropriate response actions for USEPA approval.

APPENDIX B

LABORATORY REPORT

Rec'd CRA

NOV 28 2000

SEVERN

TRENT

SERVICES

STL North Canton

4101 Shuffel Drive NW

North Canton, OH 44720-6961

Tel: 330 497 9396

Fax: 330 497 0772

www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. 3581

SPIEGELBERG

Lot #: A0J260195

Anita Kieswetter

Conestoga-Rovers & Assoc., Ltd.

651 Colby Dr.

Waterloo, Ontario, N2V 1C2

SEVERN TRENT LABORATORIES, INC.



Amy L. McCormick

Project Manager

November 26, 2000

CASE NARRATIVE

A0J260195

The following report contains the analytical results for ten water samples and one quality control sample submitted to STL North Canton by Conestoga-Rovers & Associates, Ltd. from the Spiegelberg Site, project number 3581. The samples were received October 26, 2000, according to documented sample acceptance procedures.

STL utilizes USEPA approved methods in all analytical work. The samples presented in this report were analyzed for the parameter listed on the analytical methods summary page in accordance with the method indicated. Preliminary results were provided by electronic mail to Anita Kieswetter on November 10, 2000. A summary of QC data for these analyses is included at the rear of the report.

The results included in this report have been reviewed for compliance with the laboratory QA/QC plan. All data have been found to be compliant with laboratory protocol.

SUPPLEMENTAL QC INFORMATION

GC/MS VOLATILES

Some reporting limits are lower than our standard reporting limits (SRLs) but are supported by the laboratory's MDL and/or IDLs; however, there are no standards in the calibration curve low enough to support these values. The continuing calibration blanks and method blanks may not support the lower RLs.

ANALYTICAL METHODS SUMMARY

A0J260195

<u>PARAMETER</u>	<u>ANALYTICAL METHOD</u>
Volatile Organics by GC/MS	SW846 8260B

References:

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

A0J260195

WO #	SAMPLE#	CLIENT SAMPLE ID	DATE	TIME
DNTND	001	GW-3581-102400-BW-037	10/24/00	
DNTNM	002	GW-3581-102400-BW-038	10/24/00	
DNTNQ	003	GW-3581-102400-BW-039	10/24/00	
DNTNR	004	GW-3581-102400-BW-040	10/24/00	
DNTNV	005	GW-3581-102400-BW-041	10/24/00	
DNTN5	006	GW-3581-102500-BW-042	10/25/00	
DNTN7	007	GW-3581-102500-BW-043	10/25/00	
DNTN9	008	GW-3581-102500-BW-044	10/25/00	
DNTPA	009	GW-3581-102500-BW-045	10/25/00	
DNTPE	010	GW-3581-102500-BW-046	10/25/00	
DNTPF	011	TRIP BLANK	10/25/00	

NOTE (S) :

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102400-BW-037

GC/MS Volatiles

Lot-Sample #....: A0J260195-001	Work Order #....: DNTND1AA	Matrix.....: WG
Date Sampled....: 10/24/00	Date Received...: 10/26/00	
Prep Date.....: 11/03/00	Analysis Date...: 11/03/00	
Prep Batch #....: 0308177		
Dilution Factor: 1	Method.....: SW846 8260B	

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	2.7	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	1.6	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
1,2-Dichloroethane-d4	101	(61 - 128)
Toluene-d8	83	(76 - 110)
Dibromofluoromethane	104	(73 - 122)
4-Bromofluorobenzene	82	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102400-BW-038

GC/MS Volatiles

Lot-Sample #... : A0J260195-002	Work Order #... : DNTNM1AA	Matrix..... : WG
Date Sampled... : 10/24/00	Date Received... : 10/26/00	
Prep Date..... : 11/03/00	Analysis Date... : 11/03/00	
Prep Batch #... : 0308177		
Dilution Factor: 1	Method..... : SW846 8260B	

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	1.8	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	2.0	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1,2-Dichloroethane-d4	100	(61 - 128)
Toluene-d8	80	(76 - 110)
Dibromofluoromethane	99	(73 - 122)
4-Bromofluorobenzene	79	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102400-BW-039

GC/MS Volatiles

Lot-Sample #....: A0J260195-003	Work Order #....: DNTNQ1AA	Matrix.....: WG
Date Sampled....: 10/24/00	Date Received...: 10/26/00	
Prep Date.....: 11/03/00	Analysis Date...: 11/03/00	
Prep Batch #....: 0308177		
Dilution Factor: 1	Method.....: SW846 8260B	

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1,2-Dichloroethane-d4	104	(61 - 128)
Toluene-d8	83	(76 - 110)
Dibromofluoromethane	107	(73 - 122)
4-Bromofluorobenzene	83	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102400-BW-040

GC/MS Volatiles

Lot-Sample #....: A0J260195-004 Work Order #....: DNTNR1AA Matrix.....: WG
 Date Sampled....: 10/24/00 Date Received...: 10/26/00
 Prep Date.....: 11/03/00 Analysis Date...: 11/03/00
 Prep Batch #....: 0308177
 Dilution Factor: 1 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	41	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1,2-Dichloroethane-d4	105	(61 - 128)
Toluene-d8	82	(76 - 110)
Dibromofluoromethane	104	(73 - 122)
4-Bromofluorobenzene	81	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102400-BW-041

GC/MS Volatiles

Lot-Sample #....: A0J260195-005 Work Order #....: DNTNV1AA Matrix.....: WG
 Date Sampled....: 10/24/00 Date Received...: 10/26/00
 Prep Date.....: 11/03/00 Analysis Date...: 11/03/00
 Prep Batch #....: 0308177
 Dilution Factor: 1 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1,2-Dichloroethane-d4	103	(61 - 128)
Toluene-d8	81	(76 - 110)
Dibromofluoromethane	104	(73 - 122)
4-Bromofluorobenzene	79	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102500-BW-042

GC/MS Volatiles

Lot-Sample #....: A0J260195-006 Work Order #....: DNTN51AA Matrix.....: WG
 Date Sampled....: 10/25/00 Date Received...: 10/26/00
 Prep Date.....: 11/02/00 Analysis Date...: 11/02/00
 Prep Batch #....: 0308177
 Dilution Factor: 1 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	4.7	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1,2-Dichloroethane-d4	101	(61 - 128)
Toluene-d8	83	(76 - 110)
Dibromofluoromethane	99	(73 - 122)
4-Bromofluorobenzene	81	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102500-BW-043

GC/MS Volatiles

Lot-Sample #....: A0J260195-007	Work Order #....: DNTN71AA	Matrix.....: WG
Date Sampled....: 10/25/00	Date Received...: 10/26/00	
Prep Date.....: 11/03/00	Analysis Date...: 11/03/00	
Prep Batch #....: 0308177		
Dilution Factor: 1	Method.....: SW846 8260B	

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u>	
		<u>LIMIT</u>	<u>UNITS</u>
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	1.4	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	3.2	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
1,2-Dichloroethane-d4	101	(61 - 128)
Toluene-d8	83	(76 - 110)
Dibromofluoromethane	100	(73 - 122)
4-Bromofluorobenzene	86	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102500-BW-044

GC/MS Volatiles

Lot-Sample #....: A0J260195-008	Work Order #....: DNTN91AA	Matrix.....: WG
Date Sampled....: 10/25/00	Date Received...: 10/26/00	
Prep Date.....: 11/03/00	Analysis Date...: 11/03/00	
Prep Batch #....: 0308177		
Dilution Factor: 1	Method.....: SW846 8260B	

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	1.4	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	3.2	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY	
		LIMITS	
1,2-Dichloroethane-d4	103	(61 - 128)	
Toluene-d8	81	(76 - 110)	
Dibromofluoromethane	105	(73 - 122)	
4-Bromofluorobenzene	81	(74 - 116)	

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102500-BW-045

GC/MS Volatiles

Lot-Sample #....: A0J260195-009	Work Order #....: DNTPA1AA	Matrix.....: WG
Date Sampled....: 10/25/00	Date Received...: 10/26/00	
Prep Date.....: 11/03/00	Analysis Date...: 11/03/00	
Prep Batch #....: 0308177		
Dilution Factor: 1	Method.....: SW846 8260B	

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	1.0	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	1.1	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	15	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
1,2-Dichloroethane-d4	105	(61 - 128)
Toluene-d8	82	(76 - 110)
Dibromofluoromethane	104	(73 - 122)
4-Bromofluorobenzene	79	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: GW-3581-102500-BW-046

GC/MS Volatiles

Lot-Sample #....: A0J260195-010 Work Order #....: DNTPE1AA Matrix.....: WG
 Date Sampled....: 10/25/00 Date Received...: 10/26/00
 Prep Date.....: 11/03/00 Analysis Date...: 11/03/00
 Prep Batch #....: 0308177
 Dilution Factor: 1 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING	
		LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT	RECOVERY
	RECOVERY	LIMITS
1,2-Dichloroethane-d4	103	(61 - 128)
Toluene-d8	80	(76 - 110)
Dibromofluoromethane	105	(73 - 122)
4-Bromofluorobenzene	79	(74 - 116)

CONESTOGA-ROVERS & ASSOC., LTD.

Client Sample ID: TRIP BLANK

GC/MS Volatiles

Lot-Sample #....: A0J260195-011 Work Order #....: DNTPF1AA Matrix.....: WQ
 Date Sampled....: 10/25/00 Date Received...: 10/26/00
 Prep Date.....: 11/03/00 Analysis Date...: 11/03/00
 Prep Batch #....: 0308177
 Dilution Factor: 1 Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Acetone	ND	10	ug/L
Benzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
2-Butanone	ND	10	ug/L
Carbon disulfide	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	2.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	2.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
cis-1,2-Dichloroethene	ND	0.50	ug/L
trans-1,2-Dichloroethene	ND	0.50	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
2-Hexanone	ND	10	ug/L
Methylene chloride	ND	1.0	ug/L
4-Methyl-2-pentanone	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Vinyl chloride	ND	2.0	ug/L
Xylenes (total)	ND	1.0	ug/L

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1,2-Dichloroethane-d4	104	(61 - 128)
Toluene-d8	82	(76 - 110)
Dibromofluoromethane	107	(73 - 122)
4-Bromofluorobenzene	83	(74 - 116)

QUALITY CONTROL SECTION

QUALITY CONTROL ELEMENTS OF SW-846 METHODS

STL North Canton conducts a quality assurance/quality control (QA/QC) program designed to provide scientifically valid and legally defensible data. Toward this end, several types of quality control indicators are incorporated into the QA/QC program, which is described in detail in QA Policy, QA-003. These indicators are introduced into the sample testing process to provide a mechanism for the assessment of the analytical data.

QC BATCH

Environmental samples are taken through the testing process in groups called QUALITY CONTROL BATCHES (QC batches). A QC batch contains up to twenty environmental samples of a similar matrix (water, soil) that are processed using the same reagents and standards. STL North Canton requires that each environmental sample be associated with a QC batch.

Several quality control samples are included in each QC batch and are processed identically to the twenty environmental samples. These QC samples include a METHOD BLANK (MB), a LABORATORY CONTROL SAMPLE (LCS) and, where appropriate, a MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) pair or a MATRIX SPIKE/SAMPLE DUPLICATE (MS/DU) pair. If there is insufficient sample to perform an MS/MSD or an MS/DU, then a LABORATORY CONTROL SAMPLE DUPLICATE (LCSD) is included in the QC batch.

LABORATORY CONTROL SAMPLE

The Laboratory Control Sample is a QC sample that is created by adding known concentrations of a full or partial set of target analytes to a matrix similar to that of the environmental samples in the QC batch. The LCS analyte recovery results are used to monitor the analytical process and provide evidence that the laboratory is performing the method within acceptable guidelines. All control analytes indicated by a bold type in the LCS must meet acceptance criteria. Failure to meet the established recovery guidelines requires the reparation and reanalysis of all samples in the QC batch. The only exception is that if the LCS recoveries are biased high and the associated sample is ND for the parameter(s) of interest, the batch is acceptable.

At times, a Laboratory Control Sample Duplicate (LCSD) is also included in the QC batch. An LCSD is a QC sample that is created and handled identically to the LCS. Analyte recovery data from the LCSD is assessed in the same way as that of the LCS. The LCSD recoveries, together with the LCS recoveries, are used to determine the reproducibility (precision) of the analytical system. Precision data are expressed as relative percent differences (RPDs). If the RPD fails for an LCS/LCSD and yet the recoveries are within acceptance criteria, the batch is still acceptable.

METHOD BLANK

The Method Blank is a QC sample consisting of all the reagents used in analyzing the environmental samples contained in the QC batch. Method Blank results are used to determine if interference or contamination in the analytical system could lead to the reporting of false positive data or elevated analyte concentrations. All target analytes must be below the reporting limits (RL) or the associated sample(s) must be ND except under the following circumstances:

- Common organic contaminants may be present at concentrations up to 5 times the reporting limits. Common metals contaminants may be present at concentrations up to 2 times the reporting limit, or the reported blank concentration must be twenty fold less than the concentration reported in the associated environmental samples. (See common laboratory contaminants listed below.)

Volatile (GC or GC/MS)

Methylene chloride
Acetone
2-Butanone

Semivolatile (GC/MS)

Phthalate Esters

Metals

Copper
Iron
Zinc
Lead*

* for analyses run on TJA Trace ICP or GFAA only

QUALITY CONTROL ELEMENTS OF SW-846 METHODS (Continued)

- Organic blanks will be accepted if compounds detected in the blank are present in the associated samples at levels 10 times the blank level. Inorganic blanks will be accepted if elements detected in the blank are present in the associated samples at 20 times the blank level.
- Blanks will be accepted if the compounds/elements detected are not present in any of the associated environmental samples.

Failure to meet these Method Blank criteria requires the reparation and reanalysis of all samples in the QC batch.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

A Matrix Spike and a Matrix Spike Duplicate are a pair of environmental samples to which known concentrations of a full or partial set of target analytes are added. The MS/MSD results are determined in the same manner as the results of the environmental sample used to prepare the MS/MSD. The analyte recoveries and the relative percent differences (RPDs) of the recoveries are calculated and used to evaluate the effect of the sample matrix on the analytical results. Due to the potential variability of the matrix of each sample, the MS/MSD results may not have an immediate bearing on any samples except the one spiked; therefore, the associated batch MS/MSD may not reflect the same compounds as the samples contained in the analytical report. When these MS/MSD results fail to meet acceptance criteria, the data is evaluated. If the LCS is within acceptance criteria, the batch is considered acceptable. The acceptance criteria do not apply to samples that are diluted for organics if the native sample amount is 4x the concentration of the spike.

For certain methods, a Matrix Spike/Sample Duplicate (MS/DU) may be included in the QC batch in place of the MS/MSD. For the parameters (i.e. pH, ignitability) where it is not possible to prepare a spiked sample, a Sample Duplicate may be included in the QC batch. However, a Sample Duplicate is less likely to provide usable precision statistics depending on the likelihood of finding concentrations below the standard reporting limit. When the Sample Duplicate result fails to meet acceptance criteria, the data is evaluated.

SURROGATE COMPOUNDS

In addition to these batch-related QC indicators, each organic environmental and QC sample are spiked with surrogate compounds. Surrogates are organic chemicals that behave similarly to the analytes of interest and that are rarely present in the environment. Surrogate recoveries are used to monitor the individual performance of a sample in the analytical system.

If the surrogate recoveries are outside criteria for environmental or MS/MSD samples, the batch is acceptable if the Method Blank, LCS, and LCSD surrogate recoveries are within acceptance criteria. The only exception is if the surrogate recoveries are biased high in the LCS, LCSD, or the Method Blank and the associated sample(s) are ND, the batch is acceptable. If the LCS, LCSD, or Method Blank surrogate(s) fail to meet recovery criteria, the entire sample batch is reprepared and reanalyzed.

For the GC/MS BNA methods, the surrogate criterion is that two of the three surrogates for each fraction must meet acceptance criteria. The third surrogate must have a recovery of ten percent or greater.

For the Pesticide/PCB, PAH, and Herbicide methods, the surrogate criteria is that one of two surrogate compounds meet acceptance criteria.

STL North Canton, Certifications and Approvals:

Alabama (#41170), California (#2157), Connecticut (#PH-0590), Florida (#E87225) – Florida CompQAPP (#890651G), Kentucky (#90021), Massachusetts (#M-OH048), Maryland (#272), Minnesota (#39-999-348), Missouri (#6090), New Jersey (#74001), New York (#10975), North Dakota (#R-156), Ohio (#6090), OhioVAP (#CL0024), Pennsylvania (#68-340), South Carolina (#92007001, #92007002, #92007003), Tennessee (#02903), West Virginia (#210), Wisconsin (#999518190), NAVY, ARMY, USDA Soil Permit, ACIL Seal of Excellence – Participating Lab Status Award (#82)

LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #....: A0J260195 Work Order #....: DN95T1AC Matrix.....: WATER
 LCS Lot-Sample#: A0K030000-177
 Prep Date.....: 11/02/00 Analysis Date...: 11/02/00
 Prep Batch #....: 0308177
 Dilution Factor: 1

<u>PARAMETER</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>	<u>METHOD</u>
Benzene	98	(80 - 116)	SW846 8260B
Chlorobenzene	111	(76 - 117)	SW846 8260B
1,1-Dichloroethene	107	(63 - 130)	SW846 8260B
Toluene	107	(74 - 119)	SW846 8260B
Trichloroethene	105	(75 - 122)	SW846 8260B

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
1,2-Dichloroethane-d4	102	(61 - 128)
Toluene-d8	87	(76 - 110)
Dibromofluoromethane	94	(73 - 122)
4-Bromofluorobenzene	79	(74 - 116)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: A0J260195
MB Lot-Sample #: A0K030000-177

Work Order #...: DN95T1AA

Matrix.....: WATER

Analysis Date...: 11/02/00
Dilution Factor: 1

Prep Date.....: 11/02/00

Prep Batch #...: 0308177

PARAMETER	RESULT	REPORTING			METHOD
		LIMIT	UNITS		
Acetone	ND	10	ug/L	SW846	8260B
Benzene	ND	1.0	ug/L	SW846	8260B
Bromodichloromethane	ND	1.0	ug/L	SW846	8260B
Bromoform	ND	1.0	ug/L	SW846	8260B
Bromomethane	ND	1.0	ug/L	SW846	8260B
2-Butanone	ND	10	ug/L	SW846	8260B
Carbon disulfide	ND	1.0	ug/L	SW846	8260B
Carbon tetrachloride	ND	1.0	ug/L	SW846	8260B
Chlorobenzene	ND	1.0	ug/L	SW846	8260B
Dibromochloromethane	ND	1.0	ug/L	SW846	8260B
Chloroethane	ND	2.0	ug/L	SW846	8260B
Chloroform	ND	1.0	ug/L	SW846	8260B
Chloromethane	ND	2.0	ug/L	SW846	8260B
1,1-Dichloroethane	ND	1.0	ug/L	SW846	8260B
1,2-Dichloroethane	ND	1.0	ug/L	SW846	8260B
1,1-Dichloroethene	ND	1.0	ug/L	SW846	8260B
cis-1,2-Dichloroethene	ND	0.50	ug/L	SW846	8260B
trans-1,2-Dichloroethene	ND	0.50	ug/L	SW846	8260B
1,2-Dichloropropane	ND	1.0	ug/L	SW846	8260B
cis-1,3-Dichloropropene	ND	1.0	ug/L	SW846	8260B
trans-1,3-Dichloropropene	ND	1.0	ug/L	SW846	8260B
Ethylbenzene	ND	1.0	ug/L	SW846	8260B
2-Hexanone	ND	10	ug/L	SW846	8260B
Methylene chloride	ND	1.0	ug/L	SW846	8260B
4-Methyl-2-pentanone	ND	5.0	ug/L	SW846	8260B
Styrene	ND	1.0	ug/L	SW846	8260B
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L	SW846	8260B
Tetrachloroethene	ND	1.0	ug/L	SW846	8260B
Toluene	ND	1.0	ug/L	SW846	8260B
1,1,1-Trichloroethane	ND	1.0	ug/L	SW846	8260B
1,1,2-Trichloroethane	ND	1.0	ug/L	SW846	8260B
Trichloroethene	ND	1.0	ug/L	SW846	8260B
Vinyl chloride	ND	2.0	ug/L	SW846	8260B
Xylenes (total)	ND	1.0	ug/L	SW846	8260B

SURROGATE	PERCENT	RECOVERY
	RECOVERY	LIMITS
1,2-Dichloroethane-d4	97	(61 - 128)
Toluene-d8	82	(76 - 110)
Dibromofluoromethane	93	(73 - 122)
4-Bromofluorobenzene	81	(74 - 116)

(Continued on next page)

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: A0J260195

Work Order #...: DN95T1AA

Matrix.....: WATER

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #....: A0J260195 Work Order #....: DNTN51AC-MS Matrix.....: WG
 MS Lot-Sample #: A0J260195-006 DNTN51AD-MSD
 Date Sampled...: 10/25/00 Date Received...: 10/26/00
 Prep Date.....: 11/03/00 Analysis Date...: 11/03/00
 Prep Batch #....: 0308177
 Dilution Factor: 1

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD
Benzene	96	(76 - 118)			SW846 8260B
	97	(76 - 118)	1.0	(0-20)	SW846 8260B
Chlorobenzene	112	(76 - 117)			SW846 8260B
	109	(76 - 117)	2.9	(0-20)	SW846 8260B
1,1-Dichloroethene	107	(62 - 130)			SW846 8260B
	112	(62 - 130)	3.8	(0-20)	SW846 8260B
Toluene	109	(70 - 119)			SW846 8260B
	108	(70 - 119)	0.77	(0-20)	SW846 8260B
Trichloroethene	104	(62 - 130)			SW846 8260B
	108	(62 - 130)	3.3	(0-20)	SW846 8260B

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
1,2-Dichloroethane-d4	104	(61 - 128)
	91	(61 - 128)
Toluene-d8	89	(76 - 110)
	85	(76 - 110)
Dibromofluoromethane	100	(73 - 122)
	98	(73 - 122)
4-Bromofluorobenzene	76	(74 - 116)
	80	(74 - 116)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

CRA

CONESTOGA-ROVERS & ASSOCIATES, INC.
11100 Metro Airport Center Drive - Suite 160
Romulus, MI 48174 (734) 942-0909

SHIPPED TO (Laboratory Name):

STL - North Canton

REFERENCE NUMBER:

3581

PROJECT NAME:

Spiegelberg

CHAIN OF CUSTODY RECORDSAMPLER'S
SIGNATURE:*Bart Williams*

PRINTED

NAME: BART M. Williams

PARAMETERS

TAI VOL 3

SEQ. No.	DATE	TIME	SAMPLE TYPE	No. OF CONTAINERS	REMARKS
	10/24/00	AM	6W-3581-102400-BW-037	3	X
		AM	038	3	X
		PM	039	3	X
		PM	040	3	X
		PM	041	3	X
	10/25/00	AM	6W-3581-102500-BW-042	9	X
		AM	043	3	X
		AM	044	2	X
		PM	045	2	X
		PM	046	3	X
			TE: p Blank	1	X
TOTAL NUMBER OF CONTAINERS					
					add vol ms/msd
					CRA contact Paul W. Stern

RELINQUISHED BY:

1.

Bart Williams

DATE: 10/25/00

TIME: 1400

RECEIVED BY:

1.

DATE:

TIME:

RELINQUISHED BY:

2.

DATE:

TIME:

RECEIVED BY:

2.

DATE:

TIME:

RELINQUISHED BY:

3.

DATE:

TIME:

RECEIVED BY:

1.

DATE:

TIME:

METHOD OF SHIPMENT:

Fed-Ex

AIR BILL No.

White
Yellow-Fully Executed Copy
-Receiving Laboratory CopyPink
Goldenrod
-Shipper Copy
-Sampler Copy

SAMPLE TEAM:

RECEIVED FOR LABORATORY BY:

Shirley Sanders

DATE: 10-26-00 TIME: 915

14696

C

APPENDIX C

DATA VALIDATION MEMORANDUM



**CONESTOGA-ROVERS
& ASSOCIATES**

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

MEMORANDUM

TO: Jennifer Maude

REF. NO.: 3581

FROM: Anita Kieswetter/ev/69

DATE: November 28, 2000

RE: **Data Quality Assessment and Validation for the
Groundwater Samples Collected at the
Spiegelberg Site in Livingston County, Michigan**

The following details a data quality assessment and validation for ten groundwater samples and one trip blank sample collected October 24 and 25, 2000 at the Spiegelberg Site in Livingston County, Michigan. The samples collected are listed in Table 1. All samples collected were sent to Severn Trent Laboratories, Inc. (STL) of North Canton, Ohio and analyzed for the target compound list (TCL) volatile organic compounds (VOCs) as listed in Table 2. The methods used are also presented in Table 2. The quality assurance criteria used to assess the data were established by the methods of analysis¹.

Holding Time Periods

The holding time criterion is presented in Table 2. All analyses were prepared and analyzed within holding time criteria with no exceptions. As a result, no qualifications were granted on this basis.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by the data from concurrent preparation and analysis of method blank samples. All method blank samples analyzed were free of target compounds with no exceptions. Therefore, no data qualifications were required.

Surrogate Compound Percent Recoveries

Individual sample performance for organic analyses was monitored by assessing surrogate compound percent recovery data. Surrogate compounds were analyzed with all volatile organic compound (VOC) analyses. The samples for VOC analysis were spiked with the surrogate compounds dibromofluoromethane, 1,2-dichloroethane-d₄, toluene-d₈ and 4-bromofluorobenzene.

All surrogate recoveries fell within laboratory-established control limits, with no exceptions. Qualifications were deemed unnecessary.

¹ Application of quality assurance criteria was consistent with the relevant criteria in "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994.

Laboratory Control Sample

Laboratory control sample (LCS) analysis serves to monitor the accuracy of the laboratory preparation and analysis methods.

All LCS recoveries for target parameters fell within acceptance criteria with no exceptions. Therefore, qualifications were not required.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples- Organic Analyses

MS/MSD analyses provide insight into sample matrix effects on the sample analyses. The precision of the method is reflected by the reproducibility of the MS and MSD recoveries. A Relative Percent Difference (RPD) was calculated for all positive MS/MSD results.

MS/MSD recoveries fell within control limits, with no exceptions. Thus, no qualifications were required.

Field Quality Assurance/Quality Control (QA/QC)

To monitor potential cross-contamination of VOCs during sample transportation and storage, one trip blank sample was submitted to the laboratory for VOC analysis. Target analytes were not detected in the trip blank sample. Therefore, data qualifications were not required.

Field duplicate samples are used as an indication of field and analytical reproducibility. Field duplicate results are compared and assessed based on the RPD calculated for each pair of duplicate results. The RPD must not exceed 30% for water matrix samples. One duplicate sample set was collected and analyzed with this sampling event; GW-3581-102500-DW-043/-044. All calculated RPDs satisfied the acceptance criteria. Therefore, no data qualifications were required.

Overall Assessment

The data provided by STL demonstrate acceptable accuracy and precision and may be used without qualifications.

TABLE 1
SUMMARY OF INVESTIGATIVE SAMPLES
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN

Sample Identification

STL Analytical Report AOJ260195

GW-3581-102400-BW-037

GW-3581-102400-BW-038

GW-3581-102400-BW-039

GW-3581-102400-BW-040

GW-3581-102400-BW-041

GW-3581-102500-BW-042

GW-3581-102500-BW-043

GW-3581-102500-BW-044

GW-3581-102500-BW-045

GW-3581-102500-BW-046

TABLE 2

**SUMMARY OF ANALYTICAL METHODS
AND SAMPLE HOLDING TIMES
SPIEGELBERG SITE
LIVINGSTON COUNTY, MICHIGAN**

<i>Analysis</i>	<i>Analytical Method Used</i>	<i>Holding Time (days) Water Matrix</i>
TCL VOCs	SW-846 8260B	14

Notes:

- VOC - Volatile Organic Compounds
- TCL - Target Compound List
- SW-846 - "Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods",
EPA SW-846, November 1986 and promulgated updates.